Achievement Testing Program Provincial Report

June 1991 Administration

Grade 3 Science
Grade 6 Mathematics
Grade 9 Social Studies

Students First!
Student Evaluation

Alberta

Achievement Testing Program Provincial Report

June 1991 Administration

Alberta Education
Student Evaluation Branch

Alberta Education Cataloguing in Publication Data

Alberta. Alberta Education. Student Evaluation Branch.
Achievement testing program, provincial report: June 1991 administration: Grade 3 Science, Grade 6 Mathematics, Grade 9 Social Studies.

ISBN 0-7732-0716-3

1. Achievement tests—Alberta.
2. Educational tests and measurements—Alberta. I. Title
II. Title: Grade 3 Science, Grade 6 Mathematics, Grade 9 Social Studies.

LB3060.285.A3.A333 1992 371.26

Distribution: Superintendents of Schools • School Principals and Teachers • The Alberta Teachers' Association • Alberta School Boards Association • Alberta Education • General Public upon Request

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MESSAGE FROM THE DIRECTOR

Many people are asking how Alberta students are doing. There's a mixed answer. Some are doing very well, according to the provincial achievement tests written last June. In two of the subjects tested, Grade 3 Science and Grade 6 Math, more students than expected performed at the standard of excellence. But the test results also show that the majority of students aren't doing well enough. A smaller proportion than expected met the acceptable standard of performance.

During the testing, we carried out a special study comparing students' achievement now with that of students in 1987 and 1983. The results of the study are reported in Section 8 of this report and show that students are doing better than in the previous years. In 1991, for example, a higher percentage of Grade 3 Science students correctly answered process skills questions. The study was a complex one. It gave us useful information and helped us make some improvements in design for future studies. We would like to express our appreciation to the teachers, principals, and superintendents who helped us, and we look forward to the participation of schools in future projects.

In this year's report, our numbers express the proportion of students achieving standards on the two parts of each test—knowledge and process skills. To reach an acceptable standard, students had to succeed on questions in both areas. This is harder than gaining a certain score based on questions from just any part of the test. We expect at least 80 per cent of all students within our defined population to achieve the acceptable standard, and we expect at least 10 per cent of all students within the same population to achieve the standard of excellence.

This is the last year that we will report scores for the total test.

For the first time, we have formally sought the views of the public on how students are doing. A public advisory meeting, attended by representatives of business, professional, and community groups, told us that our young people should be doing better than the test results showed. In the coming years, we will continue asking the public if student performance is good enough.

In the next round of achievement testing, we will collect information about what students know and can do in a few new performance areas:

- problem-solving tasks in math and science
- listening and viewing skills in language arts
- participation skills in social studies

We are looking forward to including in next year's report information that will tell us more about students' achievement. Such information helps us to focus on high expectations and on ensuring that students do their best.

F Horvath

Frank G. Horvath, Director

Students
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Student Evaluation

SECTION 1
SUMMARY OF ACHIEVEMENT TEST RESULTS

Parents, educators, and the general public need to know how well Alberta students are achieving in relation to provincial curricular expectations.

The 1991 achievement test results help demonstrate what is **possible** for grades 3, 6, and 9 students to know and to do in Science, Mathematics, and Social Studies respectively.

"Knowledge of what is possible produces new enthusiasm, raises sights, establishes new challenges and ultimately can improve personal and societal performance."—Learning Mathematics/Learning Science International Assessment of Educational Progress, Educational Testing Service, February 1992.

Guidelines for interpreting the 1991 results are given in Appendix C, and Appendix D provides answers to a number of questions frequently posed by parents. The process of developing the achievement tests is outlined in Appendix E.

This section of the report describes certain broad characteristics of the student population who wrote the achievement tests and provides answers to the following questions:

- How many students wrote the achievement test for their grade and how many students did not write the achievement test for their grade?
- What percentage of the students attained the acceptable standard according to provincial criteria?
- What percentage of the students attained the standard of excellence according to provincial criteria?

For the first time, results are reported in terms of three related but different standards: curriculum standards, achievement standards, and assessment standards.

Curriculum standards are the expected student learnings, sequenced into levels that are stated for each curriculum. They include specific statements of knowledge, skills, and attitudes against which student performance is to be judged.

Achievement standards, usually expressed as percentages, state how many Alberta students are expected to reach a particular curriculum level at a specific age or year in school. It is important to point out that this judgment is not a prediction of what percentage of students will actually achieve acceptable or excellent levels of performance but rather specifies the percentage of students at a given age or year in school **who are expected** to achieve the acceptable or excellent levels. These standards apply to school, jurisdiction, and provincial achievement.

Assessment standards are the scores to be achieved by a student on a specific test or part of a test before the performance of that student is judged to be "acceptable" or "excellent" relative to the curriculum standards. Alberta Education reports the results for the achievement tests in relation to an *acceptable* standard and a standard of *excellence* level respectively.

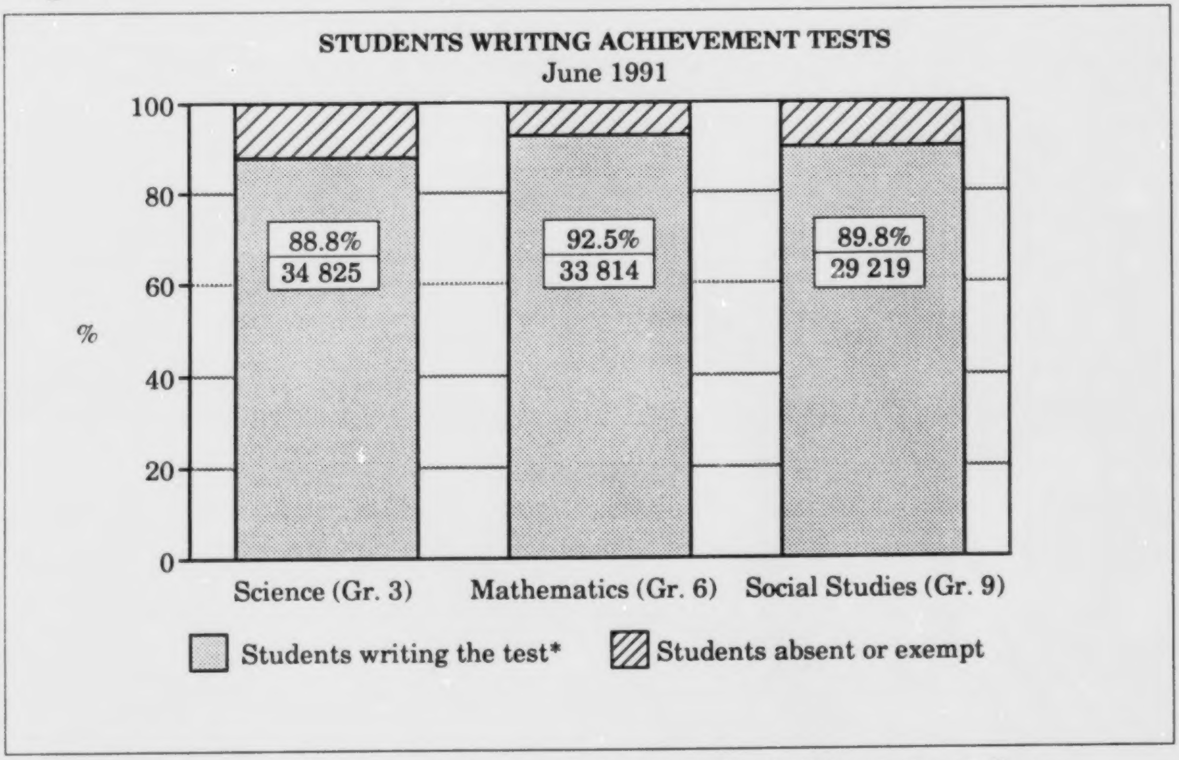
In previous years, assessment standards for the total test and for individual components were determined and reported. In 1991, in an effort to provide more meaningful and useful results to schools and jurisdictions, achievement and assessment standards are reported for **each major component** of the tests and for **both components** together.

Assessment and achievement standards for the 1991 achievement tests were determined, and subsequently recommended to the Director of Student Evaluation, by teams of curriculum specialists, test development specialists, and experienced subject classroom teachers who applied standard-setting procedures to the tasks under the guidance of the Analytic Services Unit of the Student Evaluation Branch. An outline of the processes followed is provided in Appendix A.

STUDENT POPULATIONS

In June 1991, principals reported a total population of 108 334 students in the grades tested. There were 39 216 students in Grade 3, 36 565 students in Grade 6, and 32 553 students in Grade 9. Of that total population, 97 858 wrote achievement tests. The remaining 10 476 students were exempted from writing or were absent the day the tests were administered, as shown in Figure 1-1. The tests were administered in several special forms in addition to the regular form. The information collected from the special forms was used to investigate student achievement over time and the effects of the language of testing.

Figure 1-1



*The number of students writing the tests includes students in the regular English program as well as Francophone and French Immersion students who wrote the achievement test in either English or French.

Provincial results are based on test scores achieved by students who were in the regular English program, which is defined in the first footnote for tables 2-2, 3-3, and 4-3. Results for Francophone and French Immersion students are reported directly to participating schools and jurisdictions and are not calculated in provincial results.

OBSERVATIONS ON STUDENT PARTICIPATION

The student participation rate was highest in Grade 6 (92.5%) and lowest in Grade 3 (88.8%) when calculated from the numbers reported on the Principal's Reports submitted after each achievement test administration. However, the lower participation rate in Grade 3 Science may be because there was no French translation of the test for those students instructed in French. In terms of absolute numbers, more Grade 3 students (34 825) wrote their test in Science than did Grade 6 students in Mathematics (33 814) and Grade 9 students in Social Studies (29 219).

When participation rates are calculated from the September 30, 1990, enrolment figures, however, another picture emerges. In Grade 3 Science, the participation rate decreases to 84.9%; in Grade 6 it falls to 91.1%; and in Grade 9, it is reduced to 82.3%. In terms of numbers, approximately 1 785 Grade 3 students, 549 Grade 6 students, and 2 959 Grade 9 students were not accounted for administratively at testing time. Obviously, administrative accounting must be enhanced before the next round of testing.

Details of student participation at each grade level, including the number of students who were absent or exempted, are presented in sections 2, 3, and 4 of this report.

RESULTS IN RELATION TO STANDARDS FOR STUDENTS WHO WROTE THE ACHIEVEMENT TESTS

For the 1991 results, the focus of reporting of student achievement is on the major components of the test. Results are reported in relation to the standards established for individual major components as well as for **both components**.

Based on discussions with educators, test development specialists, and curriculum specialists, and on our experience with measuring student achievement according to the expectations in the *Program of Studies*, achievement standards were confirmed as follows:

	Acceptable Standard	Standard of Excellence
Each major component	85%	15%
Both major components	80%	10%

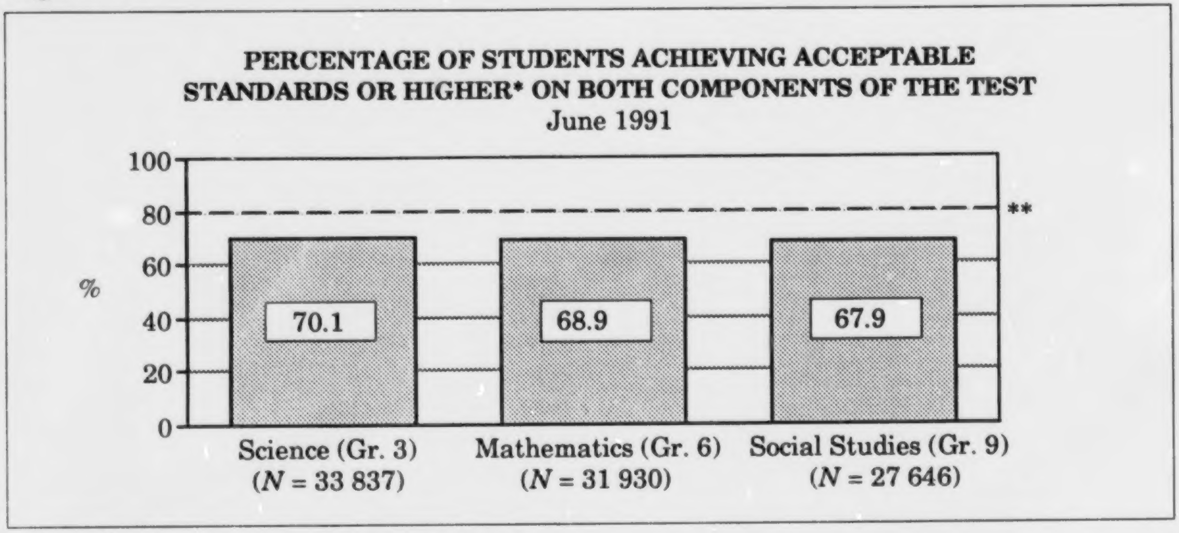
Achievement standards were also confirmed for the total test:

Acceptable Standard	85%
Standard of Excellence	15%

Standards reflect expectations for the regular English program students and not for the total population—which, for example, would include special needs students.

Figures 1-2 and 1-3 present the percentage of students who achieved the *acceptable standards* and the *standards of excellence* based on their scores on **both components** of the test.

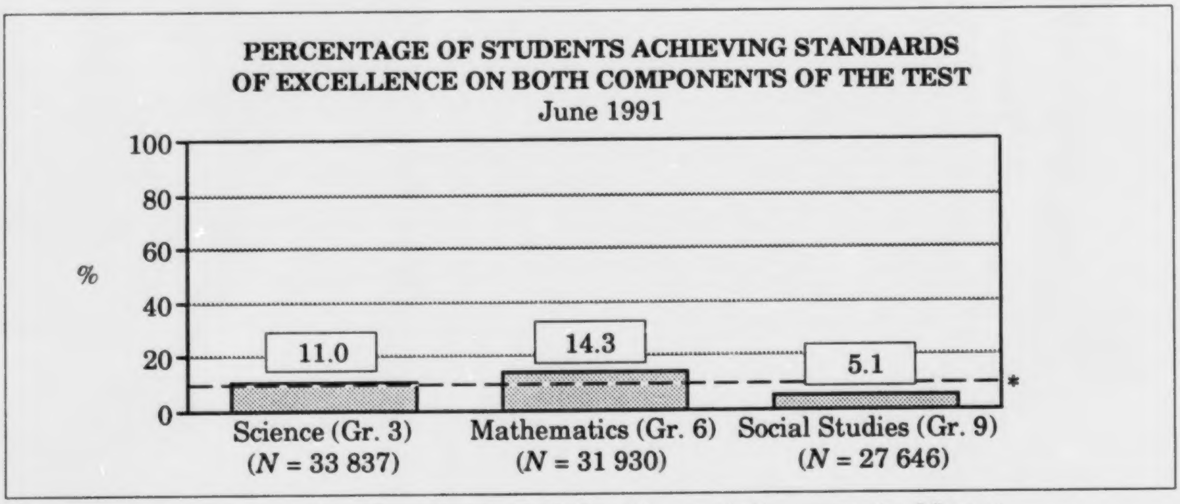
Figure 1-2



*Includes students achieving the standard of excellence

**80% of students were expected to achieve the acceptable standard or higher on both components of the test.

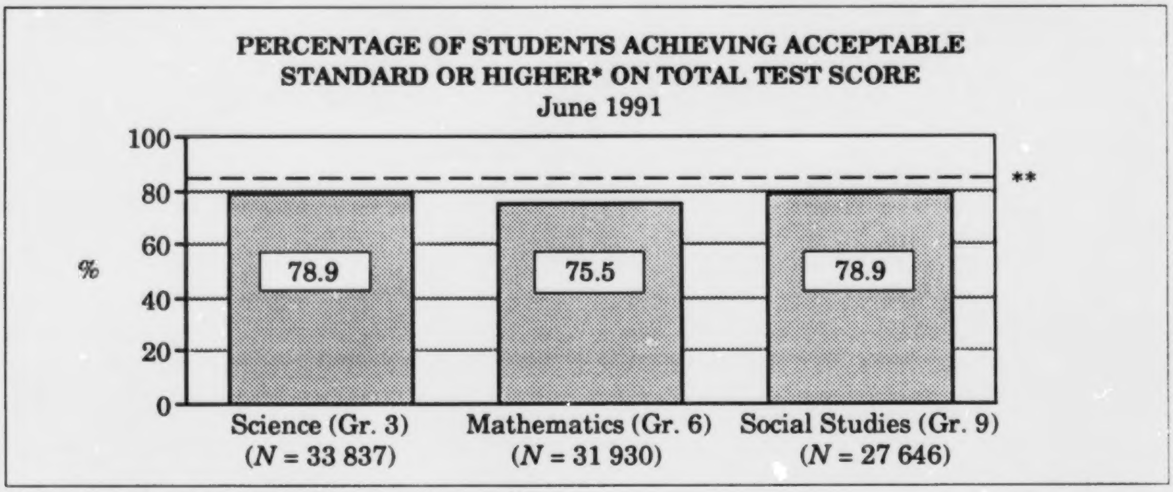
Figure 1-3



*10% of students were expected to achieve the standard of excellence on both components of the test.

Figures 1-4 and 1-5 present the percentage of students who achieved the *acceptable standard* or the *standard of excellence* based on their total test score.

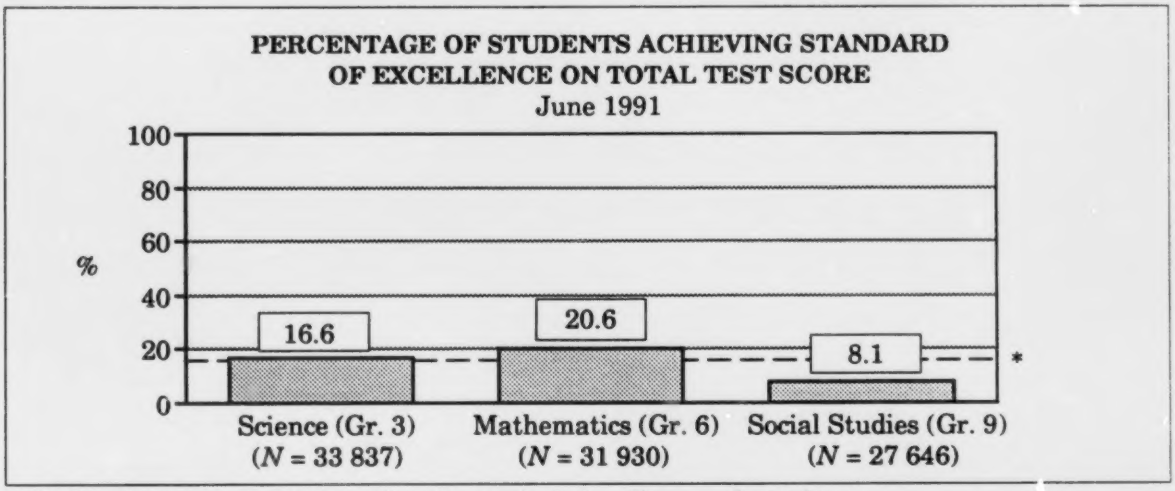
Figure 1-4



*Includes students achieving the standard of excellence

**85% of students were expected to achieve the acceptable standard or higher on the total test.

Figure 1-5



*15% of students were expected to achieve the standard of excellence on the total test.

OBSERVATIONS ON GENERAL RESULTS

In Grade 3 Science, results based on **both components** of the test revealed that the percentage of students achieving standards was lower than expected for the *acceptable standard* but slightly higher than expected for the *standard of excellence*. This pattern was similar to that of results based on the total test score, where levels of performance were lower than expected for the *acceptable standard* but slightly higher than expected for the *standard of excellence*.

Results for Grade 6 Mathematics exhibited a similar pattern. However, a smaller percentage of Grade 6 students than Grade 3 students achieved the *acceptable standard* but a larger percentage of Grade 6 students than Grade 3 students achieved the *standard of excellence*. This is true for results based on both components of the test as well as for results based on the total test score.

For Grade 9 Social Studies, results were disappointing for both levels of performance. The percentage of students achieving standards was lower than expected for the *acceptable standard* as well as for the *standard of excellence*.

In conclusion, results showed that students at all three grades need improvement to achieve the *acceptable level* and Grade 9 students also need improvement to achieve the *standard of excellence*.

SECTION 2
GRADE 3 SCIENCE

GENERAL DESCRIPTION

The Grade 3 Science Achievement Test consisted of 50 multiple-choice questions. The time allotted for writing the test was 25 minutes for each of two sections. Statistics for the total test and for the components are based on the results achieved by 33 837 students (30 427 wrote the regular form, and 3 410 participated in the achievement-over-time study, as shown in Table 2-2). This section of the report provides answers to the following questions:

- How many Grade 3 students wrote each form of the test or were absent and exempt?
- What percentage of Grade 3 students attained the acceptable standard in Science according to provincial criteria?
- What percentage of Grade 3 students attained the standard of excellence in Science according to provincial criteria?
- What did Grade 3 students know and what could they do in Science?
- What parts of the Science curriculum caused Grade 3 students difficulty?

SUMMARY OF RESULTS

RESULTS IN RELATION TO STANDARDS

Results show that 70.1% of students who wrote the test achieved the *acceptable standards* on both components and 11.0% achieved the *standards of excellence* on both components. These results were lower than expected for the *acceptable standards* but slightly higher than expected for the *standards of excellence.*

AVERAGE SCORE

The average total test score was 68.4%, with a standard deviation of 18.2. The average total test raw score was 34.2 marks out of a possible 50, with a standard deviation of 9.1.

CONTENT OF THE TEST

The Grade 3 Science Achievement Test was designed to reflect the *Grade 3 Science Curriculum Specifications* (revised May 1986) that were developed from the revised 1984 Science *Program of Studies*. The scope of the test was limited to curriculum objectives that could be efficiently measured on a paper and pencil test. As a result, questions on the test were drawn from the content of the two major components in the core program:

- Subject Matter
- Process Skills

The subject matter component consisted of questions associated with the major themes of science in Division I. The process skills component consisted of questions integrated with subject matter and questions independent of subject matter.

Questions on the Grade 3 Science Achievement Test measured student achievement in two cognitive levels:

- Knowledge—recognize or recall ideas, terminology, facts, conventions, methods of inquiry, principles, generalizations, theories, and concepts
- Comprehension and Application—demonstrate an understanding of the concepts and skills, and apply appropriate methods and ideas to a new situation

ACHIEVEMENT TEST BLUEPRINT

Table 2-1 presents the blueprint used to develop the Grade 3 Science Achievement Test. Classification of each question by component, cognitive level, and subtest is indicated in the table.

Table 2-1
Grade 3 Science
Achievement Test Blueprint
June 1991

	Component			Cognitive Level		
Curriculum Component	Process Skills	Subject Matter	Total	Knowledge	Application	Total
Matter and Energy	4 ,5, 6, 7, 8, 29, 30, 31, 32	1, 2, 3, 26, 27, 28	15 [30%]	1, 26, 27	2, 3, 4, 5, 6, 7, 8, 28, 29, 30, 31, 32	15 [30%]
Living Things and Environment	12, 13, 14, 15, 35, 37, 38, 39, 40	9, 10, 11, 33, 34, 36	15 [30%]	9, 10, 33	11, 12, 13, 14, 15, 34, 35, 36, 37, 38, 39, 40	15 [30%]
Earth, Space, and Time	16, 42	17, 41	4 [8%]	17	16, 41, 42	4 [8%]
Process Skills Independent of Prescribed Subject Matter	18, 19, 20, 21, 22, 23, 24, 25, 43, 44, 45, 46, 47, 48, 49, 50		16 [32%]	18, 45, 46	19, 20, 21, 22, 23, 24, 25, 43, 44, 47, 48, 49, 50	16 [32%]
Total	36 [72%]	14 [28%]	50 [100%]	10 [20%]	40 [80%]	50 [100%]

STUDENT PARTICIPATION

In June 1991, principals reported a total population of 39 216 students in Grade 3. Table 2-2 presents the number and percentage distribution of students who wrote the Grade 3 Science Achievement Test, who were absent, and who were exempted. Results for students in French Immersion or Francophone programs are reported separately to participating schools and jursidictions.

Table 2-2
Grade 3 Science
Student Participation
June 1991

Category	Number of Students	Percentage of Students
Total Number of Students In Regular Programs*	33 837	86.3
Students Who Wrote the Regular Form**	30 427	77.6
Students Who Wrote the Achievement-Over-Time Forms:	3 410	8.7
Form G (Green)—Same as the Regular Form	*1 169*	*3.0*
Form O (Orange)	*1 122*	*2.9*
Form F (Fuchsia)	*1 119*	*2.9*
Other Students Who Wrote:***	988	2.5
Francophone Students—Wrote in French	0	0.0
Francophone Students—Wrote in English	51	0.1
French Immersion Students—Wrote in French	0	0.0
French Immersion Students—Wrote in English	471	1.2
Language-of-Testing Students—Wrote in French	232	0.6
Language-of-Testing Students—Wrote in English	234	0.6
Students Absent	1 502	3.8
Students Exempted from Writing	2 889	7.4
Categories of Exemption:		
1. Special Needs Students	1 014	2.6
2. Subject Was Not Taught This Term	337	0.9
3. ESL Students	548	1.4
4. Language of Instruction Was Not English	805	2.1
5. Other (as approved by the Superintendent)	185	0.5
Total Principals' Reported Population: Test Day, June 1991	39 216	100.0

Grade 3 Enrolment: September 30, 1990	41 001

*Provincial results are based on test scores achieved by students who were in the "regular" (Mathematics or Science or Social Studies) programs. Such students are defined as those who were instructed in English and wrote the English form of the achievement test, and those students who were instructed in a language other than English or French and wrote the English form of the test. These students are indicated by the shaded area of the table.

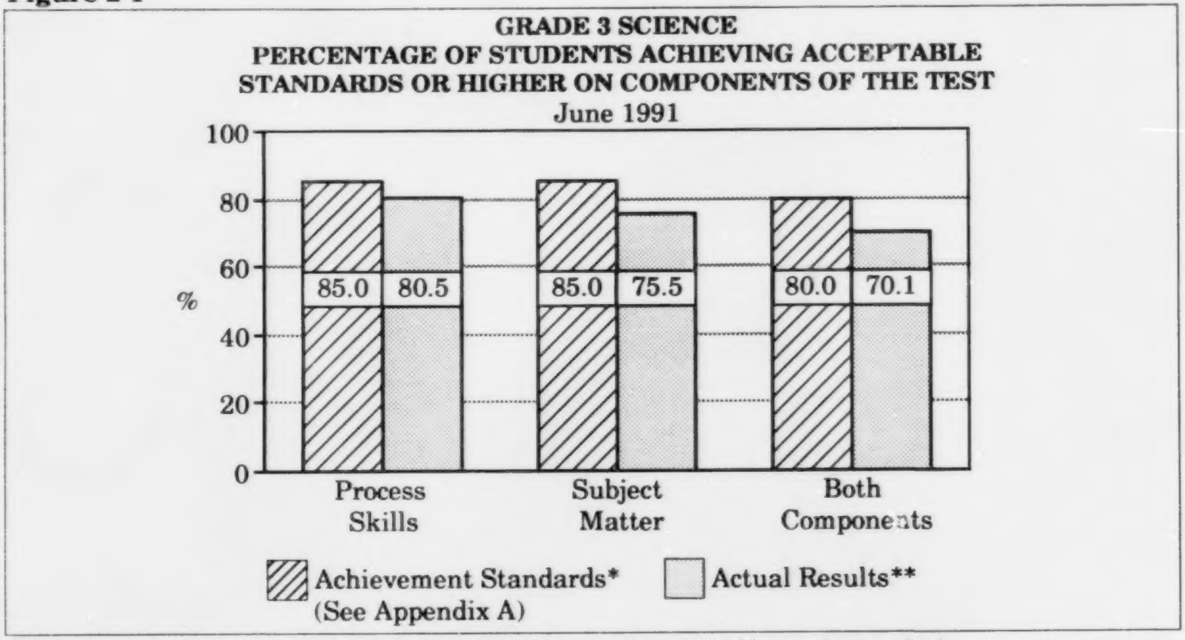
**Regular Form refers to the unmodified 1991 test. The modified tests are described in Section 8 of this report.

***Results for Francophone or French Immersion students or for students participating in the language-of-testing study are reported directly to participating schools and jurisdictions and are not calculated in the provincial results.

RESULTS IN RELATION TO STANDARDS

Figures 2-1 and 2-2 and Table 2-3 show the percentage of students achieving the acceptable standards and the standards of excellence on components of the test. The levels of performance were higher than expected for the standards of excellence and lower than expected for the acceptable standards.

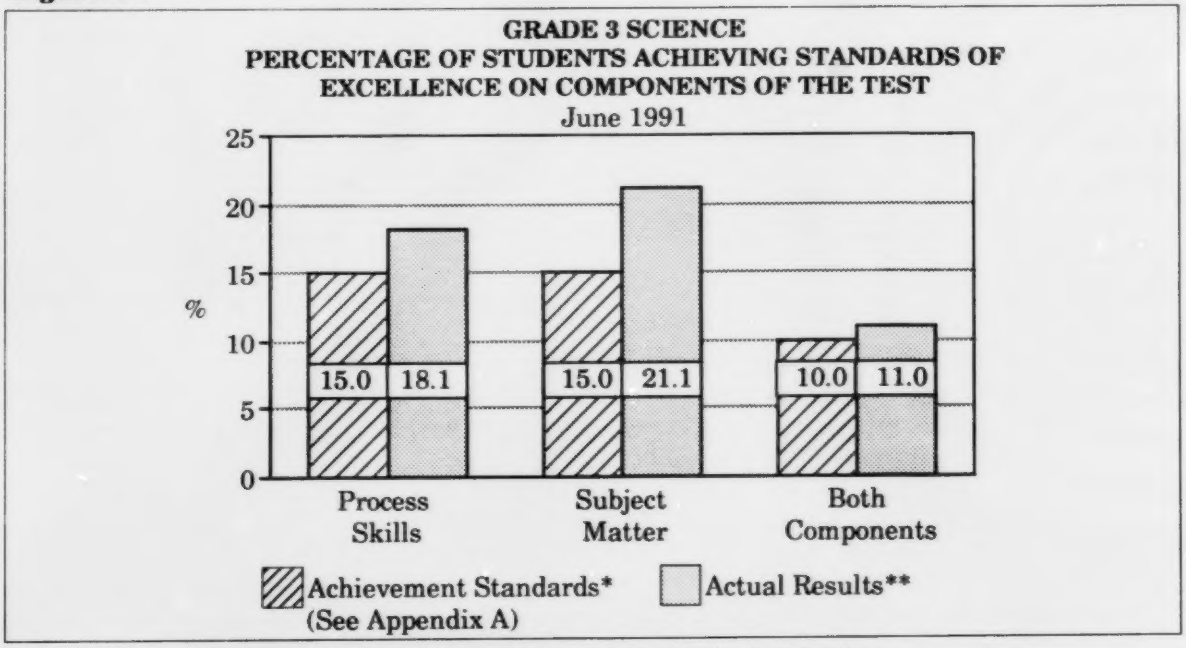
Figure 2-1



GRADE 3 SCIENCE
PERCENTAGE OF STUDENTS ACHIEVING ACCEPTABLE STANDARDS OR HIGHER ON COMPONENTS OF THE TEST
June 1991

*the percentage of students in the province expected to meet the acceptable standards or higher
**the percentage of students in the province who met the acceptable standards or higher

Figure 2-2



GRADE 3 SCIENCE
PERCENTAGE OF STUDENTS ACHIEVING STANDARDS OF EXCELLENCE ON COMPONENTS OF THE TEST
June 1991

*the percentage of students in the province expected to meet the standards of excellence
**the percentage of students in the province who met the standards of excellence

Table 2-3
Grade 3 Science
Students Achieving Standards on Components of the Test
June 1991

Reporting Category	Maximum Possible Score	Provincial Assessment Standard* (Raw Score)	Provincial Achievement Standard** (Per Cent)	Expected Number	Actual Number	Actual Per Cent
Standard of Excellence						
Both Major Components***	36 + 14	32 + 12	10	3 384	3 731	11.0
Process Skills Only	36	32	15	5 076	6 134	18.1
Subject Matter Only	14	12	15	5 076	7 147	21.1
Acceptable Standard or Higher						
Both Major Components***	36 + 14	19 + 8	80	27 070	23 712	70.1
Process Skills Only	36	19	85	28 761	27 240	80.5
Subject Matter Only	14	8	85	28 761	25 546	75.5
Below Acceptable Standard on Both Components	N/A	N/A	N/A	N/A	4 763	14.1

*The Provincial Assessment Standard is a score determined by appropriate standard-setting procedures and is the lowest score students must achieve for their performance to be judged "acceptable" and/or "excellent" in relation to curricular expectations. See Appendix A.

**The Provincial Achievement Standard refers to the percentage of students expected to meet or exceed the Provincial Assessment Standard. See Appendix A.

***In previous years, a standard for the total test was reported. An individual could meet the standard for the test overall but might not achieve the standard for both components of the test. The new method of reporting allows for a more meaningful interpretation of the results. To allow comparison with results from previous years, the total test score is reported in Table 2-4.

Table 2-4 shows the percentage of students achieving the acceptable standard and the standard of excellence on the total test. These levels of performance exceeded the expectations for the standard of excellence but were lower than expected for the acceptable standard.

Table 2-4
Grade 3 Science
Students Achieving Standards on the Total Test
June 1991

Reporting Category	Maximum Possible Score	Provincial Assessment Standard* (Raw Score)	Provincial Achievement Standard** (Per Cent)	Expected Number	Actual Number	Actual Per Cent
Total Test:						
Standard of Excellence	50	44	15	5 076	5 606	16.6
Acceptable Standard or Higher	50	27	85	28 761	26 710	78.9

*The Provincial Assessment Standard is a score determined by appropriate standard-setting procedures and is the lowest score students must achieve for their performance to be judged "acceptable" and/or "excellent" in relation to curricular expectations. See Appendix A.

**The Provincial Achievement Standard refers to the percentage of students expected to meet or exceed the Provincial Assessment Standard. See Appendix A.

It should be noted that the actual percentages for Grade 3 Science (16.6 and 78.9) are based on the 33 837 students in the regular programs who wrote the test.

If, however, the percentages are based on the total population reported by principals (39 216), less the French Immersion and Francophone students who wrote the test (988), the percentages would be:
14.7% achieving the standard of excellence
69.9% achieving the acceptable standard

If the percentages are based on the September 30, 1990, Grade 3 enrolment (41 001), less the French Immersion and Francophone students who wrote the test (988), the percentages would be:
14.0% achieving the standard of excellence
66.8% achieving the acceptable standard

It is emphasized that the above percentages, based on the total population and enrolment figures, present the worst possible scenario. It is highly unlikely that none of the students who was absent, exempt, or not accounted for would have achieved standards. The absence of information on these students is nonetheless problematic.

The number of students achieving the *acceptable standard* and the *standard of excellence* for each jurisdiction was analysed to determine whether jurisdictions were below, meeting, or exceeding provincial achievement standards. Jurisdictions classified as meeting provincial achievement standards were those for which the difference between the actual number of students and the expected number of students at or above standards was not statistically significant. A 95% confidence interval was used; this criterion means that differences are only reported when there is a 5% or smaller probability that a difference of that size could occur by chance. The results are reported in Tables 2-5 and 2-6. ***The percentages in the tables are based on 200 jurisdictions (including private schools).***

Table 2-5
Grade 3 Science
Percentage Distribution of Jurisdictions* Meeting Provincial Achievement Standards on Components of the Test
June 1991

Component	Jurisdictions Not Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Exceeding Provincial Achievement Standard (Per Cent)
Standard of Excellence			
Both Major Components	7.0	71.0	22.0
Process Skills Only	6.5	66.5	27.0
Subject Matter Only	3.5	58.0	38.5
Acceptable Standard or Higher			
Both Major Components	48.0	48.0	4.0
Process Skills Only	33.0	60.5	6.5
Subject Matter Only	47.5	51.0	1.5

Table 2-6
Grade 3 Science
Percentage Distribution of Jurisdictions* Meeting Provincial Achievement Standards on the Total Test
June 1991

Reporting Category	Jurisdictions Not Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Exceeding Provincial Achievement Standard (Per Cent)
Total Test:			
Standard of Excellence	9.0	66.0	25.0
Acceptable Standard or Higher	37.5	56.5	6.0

***Jurisdictions with fewer than six students are excluded because the statistical significance of the difference between the number actually meeting the standard and the number expected to meet the standard when calculated and reported is not educationally meaningful.**

REPORTING CATEGORIES

Table 2-7 shows the total marks possible and the provincial raw score results for the reporting categories of the Grade 3 Science Achievement Test.

It is important to stress that the averages in the various reporting categories cannot be directly compared with one another. Rather, the results shown in Table 2-7 can best be used in conjunction with parallel tables in the jurisdiction and school reports. Variations in patterns of students' responses can help indicate strengths and weaknesses in local educational programs.

Statistics presented in this table are based on results achieved by 31 596 students (those who wrote the regular form and those who wrote Form G).

Table 2-7
Grade 3 Science
Raw Score Results by Reporting Category
June 1991

Reporting Category	Maximum Possible Raw Score	Raw Score Average	Raw Score Standard Deviation
Total Test	50	34.2	9.1
Major Component:			
Process Skills	36	24.8	6.9
Subject Matter	14	9.4	2.7
Curricular Elements:			
Matter and Energy	15	10.4	2.7
Living Things and Environment	15	11.2	2.8
Earth, Space, and Time	4	2.4	1.1
Process Skills as Content	16	10.2	3.9
Cognitive Level:			
Knowledge	10	6.7	2.1
Understanding and Application	40	27.5	7.5

PERCENTAGE OF STUDENTS CHOOSING EACH ALTERNATIVE

Table 2-8 shows the percentage of students who chose each alternative (A, B, C, and D) for each multiple-choice question. The correct response (key) for each question is also identified. The results shown in Table 2-8 can best be used in conjunction with the parallel tables in the jurisdiction and school reports.

Variations in patterns of students' responses to questions can help to indicate strengths and weaknesses in local educational programs.

Statistics presented in this table are based on results achieved by 31 596 students (those who wrote the regular form and those who wrote Form G).

Table 2-8
Grade 3 Science
Provincial Results for Individual Multiple-Choice Questions*
June 1991

		Distribution of Responses (%)						Distribution of Responses (%)			
Item	Key	A	B	C	D	Item	Key	A	B	C	D
1	C	1.9	3.5	89.0	4.8	26	C	14.0	44.3	31.1	9.7
2	D	7.3	15.2	11.2	63.9	27	C	5.9	5.0	70.2	16.7
3	B	15.6	51.7	11.5	20.6	28	C	6.8	3.1	86.6	2.2
4	A	62.7	7.4	3.1	25.5	29	B	5.3	76.8	12.5	3.9
5	C	12.2	20.5	51.0	15.4	30	D	2.8	10.6	5.8	79.2
6	B	9.9	57.8	22.6	8.1	31	B	6.6	86.6	2.5	3.2
7	B	5.1	80.8	5.4	7.2	32	C	10.0	3.9	81.8	2.6
8	B	11.0	70.0	3.9	14.2	33	C	8.0	8.5	71.9	9.7
9	C	3.6	4.6	85.4	5.3	34	A	77.1	6.0	8.1	7.6
10	D	3.7	1.6	4.6	88.5	35	D	5.6	5.1	4.0	83.5
11	A	53.9	12.0	16.3	16.7	36	D	28.8	2.3	2.4	65.7
12	D	16.3	3.2	1.7	77.8	37	D	13.3	10.5	28.5	46.4
13	D	6.7	7.5	8.2	76.1	38	A	71.5	5.5	4.1	16.8
14	A	77.8	9.4	8.8	2.3	39	A	77.5	5.6	5.5	9.3
15	C	4.8	6.6	84.2	3.3	40	B	6.8	80.6	5.3	6.2
16	C	8.1	13.3	56.3	19.2	41	B	19.3	47.2	15.6	13.2
17	B	12.0	57.2	16.7	10.1	42	A	84.0	3.7	3.9	5.2
18	D	14.5	4.8	17.2	60.8	43	B	15.2	67.5	7.9	6.1
19	A	54.1	19.7	11.9	10.4	44	D	6.6	7.4	9.6	73.6
20	C	3.4	5.0	76.7	11.6	45	C	16.6	9.5	63.0	8.1
21	B	9.7	57.4	6.1	21.7	46	D	7.7	16.6	14.9	57.6
22	A	75.5	4.5	6.1	9.1	47	C	11.3	15.1	61.7	7.7
23	B	3.4	77.8	3.8	9.7	48	A	61.3	11.4	6.4	17.0
24	A	63.1	5.6	20.5	5.3	49	D	12.9	17.1	11.8	52.2
25	B	8.5	68.2	9.7	6.4	50	A	49.2	15.0	19.1	10.8

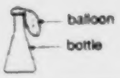
*The sum of the percentages for each question may be less than 100% because the No Response category is not included. This category is less than 8% for any of these questions.

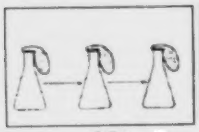
GRADE 3 SCIENCE EXAMINER'S OBSERVATIONS

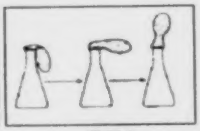
The following is a discussion of specific areas of strength and of difficulty for Grade 3 students. Sample questions are provided to highlight the strengths and weaknesses of students achieving at the acceptable standard and at the standard of excellence. For each sample question, the circle beside or under the correct answer has been filled in. The percentage of students choosing each alternative is given beside each circle.

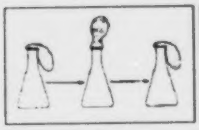
Acceptable Standard—Sample Questions and Commentary

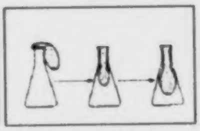
7. **If the bottle is heated, what will happen to the balloon?**




○ 5.1


● 80.8


○ 5.4


○ 7.2

19. Look at this picture.

An OBSERVATION that can be made about this pencil is that it has

54.1 ● a pointed end

19.7 ○ just been sharpened

11.9 ○ been used for writing

10.4 ○ a pink eraser on the end

28. **To conserve energy, Jean could**

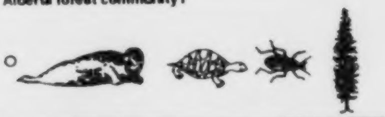
6.8 ○ turn up the heat in his house

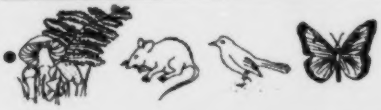
3.1 ○ leave the refrigerator door open

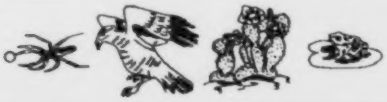
86.6 ● turn off all the lights when he goes to bed

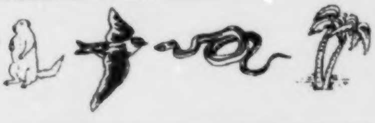
2.2 ○ leave the television on when he goes out to play

40. **Which group of plants and animals are found in an Alberta forest community?**

6.8 ○


80.6 ●


5.3 ○


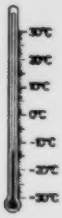
6.2 ○


What did students know and what could they do?

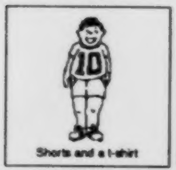
Generally, these students had an understanding of basic process skills. They could classify common animals based on similar physical characteristics; they could identify similarities presented in a graph or a chart. By observing, they could predict the next step in a sequence of events and could make simple interpretations.

Specifically, these students knew that when materials are heated, they occupy more space and can increase in size (question 7). As well, they knew that common objects made of specific materials may or may not have the capacity to float on water or be attracted by a magnet. They also could identify some common plant and animal life of Alberta (question 40) and knew the importance of conserving energy in a home (question 28). Students knew that moss and mushrooms are types of plants that grow on decaying logs, and that birds, fish, and reptiles hatch from eggs. They understood the energy (food) chains that exist between plants and animals as well as the life cycle of a plant.

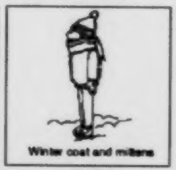
8. This is the temperature today.



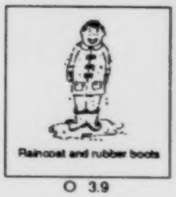
What would be BEST to wear outside today?


Shorts and a t-shirt

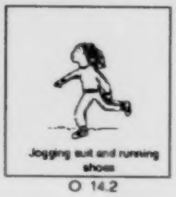
○ 11.0


Winter coat and mittens

● 70.0


Raincoat and rubber boots

○ 3.9


Jogging suit and running shoes

○ 14.2

What did students find difficult?

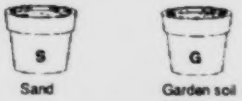
These students had difficulty applying their science knowledge to new situations or to contexts that went beyond familiar plants and animals. Generally, they could not sort out extraneous information or apply their observation skills objectively.

In question 8, for example, students achieving at the acceptable standard had difficulty making the necessary connections between temperature measurements and the conditions that exist in the environment. In question 19 (see the previous page), students were asked to make a direct observation about the pencil in the picture. Their responses indicated that they tended to rely on what they knew a pencil looked like rather than on what they could see in the picture.

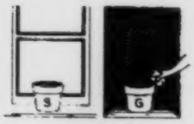
Standard of Excellence—Sample Questions and Commentary

13. Tom predicted that radish seeds grow better in sand than in garden soil.

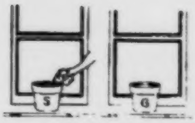
In each pot, he planted six radish seeds.



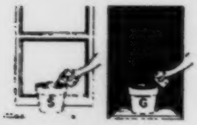
Which picture shows how Tom SHOULD test his prediction?



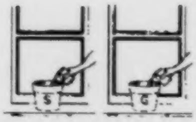
○ 6.7



○ 7.5



○ 8.2

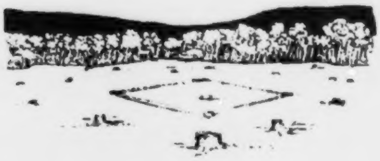


● 76.1

What did students know and what could they do?

Students achieving at the standard of excellence knew that a specific unit of measurement is necessary to make accurate measurements and that the senses of touch and sight can be used to estimate the length of an object. They also knew which variables to control when experimenting with plant growth (question 13). These students also knew that metals expand when heated and that the phase changes of water can be reversed whereas the process of burning paper cannot. In addition, they understood the interrelationship that exists between living things and their environment (question 25) and how symbols can be used to represent changes of events that occur in nature.

25. Some trees in an area were cut down to make room for a baseball diamond.



What is the MOST likely result of this change?

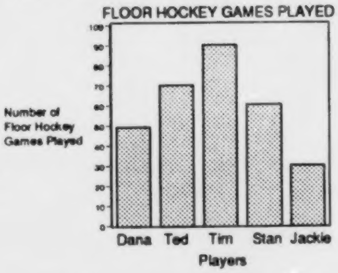
8.5 ○ There are more shady places.

68.2 ● There are fewer birds in the area.

9.7 ○ Children have less room to play.

6.4 ○ More squirrels have built homes in the area.

24. Five students recorded the number of floor hockey games each of them played in one year.



Which student played 40 more games than Jackie?

63.1 ● Ted

5.6 ○ Dana

20.5 ○ Tim

5.3 ○ Stan

These students had good observation and inference skills. They could read an outdoor thermometer, and they could order objects from lightest to heaviest based on their mass. These students could also classify unfamiliar living and nonliving things based on their observations of physical characteristics, apply general knowledge to solve novel problems, transfer new learnings gained from interpreting graphs (question 24), and analyse new situations.

What did students find difficult?

Analysis indicates that students achieving at the standard of excellence did not have any apparent difficulties with Grade 3 Science knowledge or process skills.

Teachers' Review of the Test

The Grade 3 Science teachers who reviewed the test felt that it was fair but tough. As well, they felt that the concepts and skills tested reflected the learning expectations of the Division I Science Program very well. Teachers also liked the use of questions that required students to think and apply their knowledge of science to the world they experience beyond the classroom.

SECTION 3
GRADE 6 MATHEMATICS

GENERAL DESCRIPTION

The Grade 6 Mathematics Achievement Test was divided into three booklets. Booklet 1 contained 36 questions, and students were allowed to use a calculator; Booklet 2 contained 19 questions and students were not allowed to use a calculator; Booklet 3 contained five 2-minute tests of 48 number fact questions each, and students were not allowed to use a calculator. The time allotted was 55 minutes for Booklet 1 and 30 mintues for Booklet 2.

Statistics for the total test and for components in Booklets 1 and 2 are based on the results achieved by 31 930 students (28 649 wrote the regular form, and 3 281 participated in the achievement-over-time study, as shown in Table 3-3).

This section of the report provides answers to the following questions:

- How many Grade 6 students wrote each form of the test or were absent and exempt?
- What percentage of Grade 6 students attained the acceptable standard in Mathematics according to provincial criteria?
- What percentage of Grade 6 students attained the standard of excellence in Mathematics according to provincial criteria?
- What did Grade 6 students know and what could they do in Mathematics?
- What parts of the Mathematics curriculum caused Grade 6 students difficulty?

SUMMARY OF RESULTS FOR BOOKLETS 1 AND 2

RESULTS IN RELATION TO STANDARDS

Results show that 68.9% of students who wrote the test achieved the *acceptable standards* on both components and 14.3% achieved the *standards of excellence* on both components. These results were lower than expected for the *acceptable standards* but higher than expected for the *standards of excellence*.

AVERAGE SCORE

The average total test score for booklets 1 and 2 was 68.2%, with a standard deviation of 19.1. The average raw score was 37.5 marks out of a possible 55, with a standard deviation of 10.5.

CONTENT OF THE TEST

The Grade 6 Mathematics Achievement Test was designed to reflect the *Grade 6 Mathematics Curriculum Specifications* (revised May 1986) that were developed from the revised 1982 Mathematics *Program of Studies*. The scope of the test was limited to curriculum objectives that could be efficiently measured on a paper and pencil test. Questions on the test were drawn from the content of two major components in the core program:

- Subject Matter
- Problem Solving

The subject matter component consisted of questions associated with the six content areas: numeration, operations and properties, measurement, geometry, graphing, and problem-solving strategies. The problem-solving component consisted of questions integrated with content areas and questions independent of subject matter.

Questions on the Grade 6 Mathematics Achievement Test measured student achievement at three cognitive levels:

- Knowledge—recognize or recall facts, definitions, rules, procedures, and perform routine manipulation
- Comprehension—demonstrate understanding of principles and concepts; translate from concrete to pictorial to symbolic representations or translate in the reverse order
- Application and Problem Solving—solve problems utilizing learned skills and concepts; recognize patterns and relationships; compare, interpret, and analyse data by applying learned skills and knowledge.

ACHIEVEMENT TEST BLUEPRINT

Table 3-1 presents the blueprint used to develop booklets 1 and 2 of the Grade 6 Mathematics Achievement Test. Classification of each question by component, cognitive level, and subtest is indicated in the table.

Table 3-1
Grade 6 Mathematics
Achievement Test Blueprint, Booklets 1 and 2
June 1991

	Component			Cognitive Level			
Curricular Elements	Problem Solving	Subject Matter	Total	Knowledge	Comprehension	Application and Problem Solving	Total
Numeration	4, 53, 54, 55	1, 2, 3, 5, 6, 14, 15, 38, 39	13 [23.6%]	1, 2, 14, 38, 39	3, 5, 6, 15	4, 53, 54, 55	13 [23.6%]
Operations and Properties	20, 27, 36, 41, 47, 48, 50	29, 37, 40, 42, 43, 44, 45, 46, 49	16 [29.1%]	42	29, 36, 37 ,40, 43, 44, 45, 46, 49	20, 27, 41, 47, 48, 50	16 [29.1%]
Measurement	16, 28, 35, 51, 52	7, 8, 11, 12, 13, 17	11 [20.0%]	7, 12, 13, 17	8, 11	16, 28, 35, 51, 52	11 [20.0%]
Geometry	32	9, 30, 31, 33, 34	6 [10.9%]	9, 30	31, 34	32, 33	6 [10.9%]
Graphing	21, 22, 23, 24, 25	26	6 [10.9%]	—	24, 26	21, 22, 23, 25	6 [10.9%]
Problem-Solving Strategies	10, 18, 19	—	3 [5.5%]	—	—	10, 18, 19	3 [5.5%]
Total	25 [45.5%]	30 [55.5%]	55 [100%]	12 [21.8%]	19 [34.5%]	24 [43.6%]	55 [100%]

Table 3-2 presents the blueprint used to develop Booklet 3 of the Grade 6 Mathematics Achievement Test. This booklet consisted of five timed tests, measuring student performance in operations involving sums and minuends to 18, and products and dividends to 81.

Table 3-2
Grade 6 Mathematics
Achievement Test Blueprint, Booklet 3
Number Facts: Speed and Accuracy Tests
June 1991

Operations	Time Allotted in Minutes	Number of Questions
Addition	2	48
Subtraction	2	48
Multiplication	2	48
Division	2	48
Mixed Operations	2	48

STUDENT PARTICIPATION

In June 1991, principals reported a total population of 36 565 students in Grade 6. Table 3-3 presents the number and percentage distribution of students who wrote the Grade 6 Mathematics Achievement Test, who were absent, and who were exempted. Results for students in French Immersion or Francophone programs are reported separately to participating schools and jurisdictions.

Table 3-3
Grade 6 Mathematics
Student Participation
June 1991

Category	Number of Students	Percentage of Students
Total Number of Students in Regular Programs*	31 930	87.3
Students Who Wrote the Regular Form**	28 649	78.4
Students Who Wrote the Achievement-Over-Time Forms:	3 281	9.0
Form B (Blue)—Same as the Regular Form	*1 119*	*3.1*
Form S (Salmon)	*1 079*	*3.0*
Form L (Lime)	*1 083*	*3.0*
Other Students Who Wrote:***	1 884	5.1
Francophone Students—Wrote in French	206	0.6
Francophone Students—Wrote in English	0	0.0
French Immersion Students—Wrote in French	1 057	2.9
French Immersion Students—Wrote in English	45	0.1
Language-of-Testing Students—Wrote in French	283	0.8
Language-of-Testing Students—Wrote in English	293	0.8
Students Absent	1 304	3.6
Students Exempted from Writing	1 447	4.0
Categories of Exemption:		
1. Special Needs Students	934	2.6
2. Subject Was Not Taught This Term	14	0.0
3. ESL Students	235	0.6
4. Language of Instruction Was Not English	120	0.3
5. Other (as approved by the Superintendent)	144	0.4
Total Principals' Reported Population: Test Day, June 1991	36 565	100.0

Grade 6 Enrolment: September 30, 1990	37 114

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* Provincial results are based on test scores achieved by students who were in the "regular" (Mathematics or Science or Social Studies) programs. Such students are defined as those who were instructed in English and wrote the English form of the achievement test, and those students who were instructed in a language other than English or French and wrote the English form of the test. These students are indicated by the shaded area of the table.

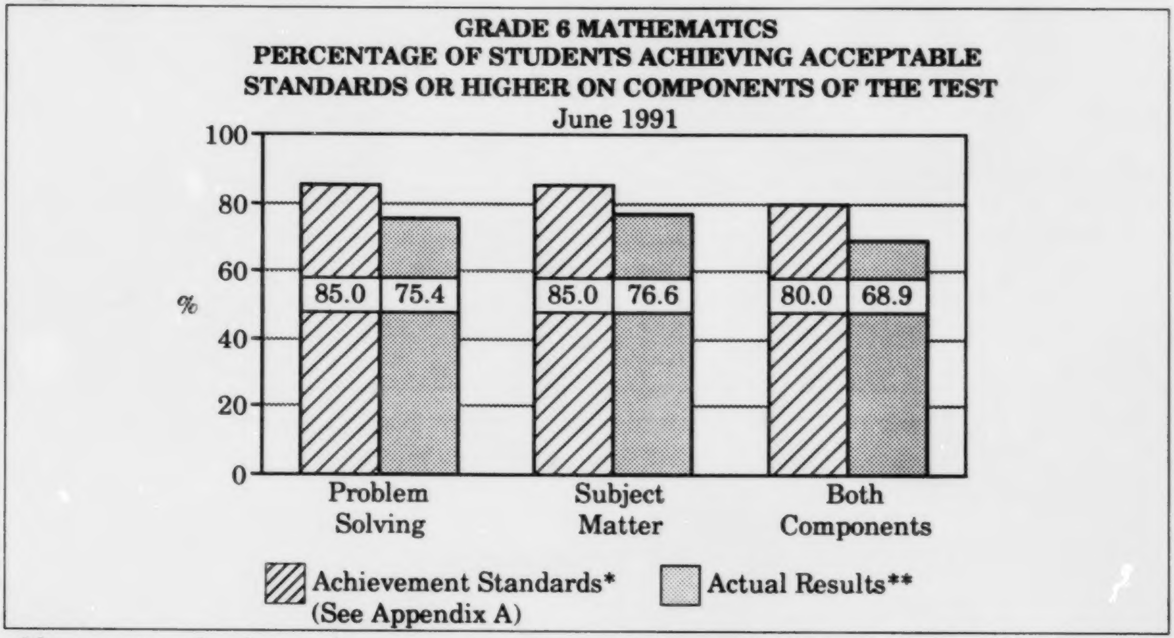
** Regular Form refers to the unmodified 1991 test. The modified tests are described in Section 8 of this report.

***Results for Francophone or French Immersion students or for students participating in the language-of-testing study are reported directly to participating schools and jurisdictions and are not calculated in the provincial results.

RESULTS FOR BOOKLETS 1 AND 2

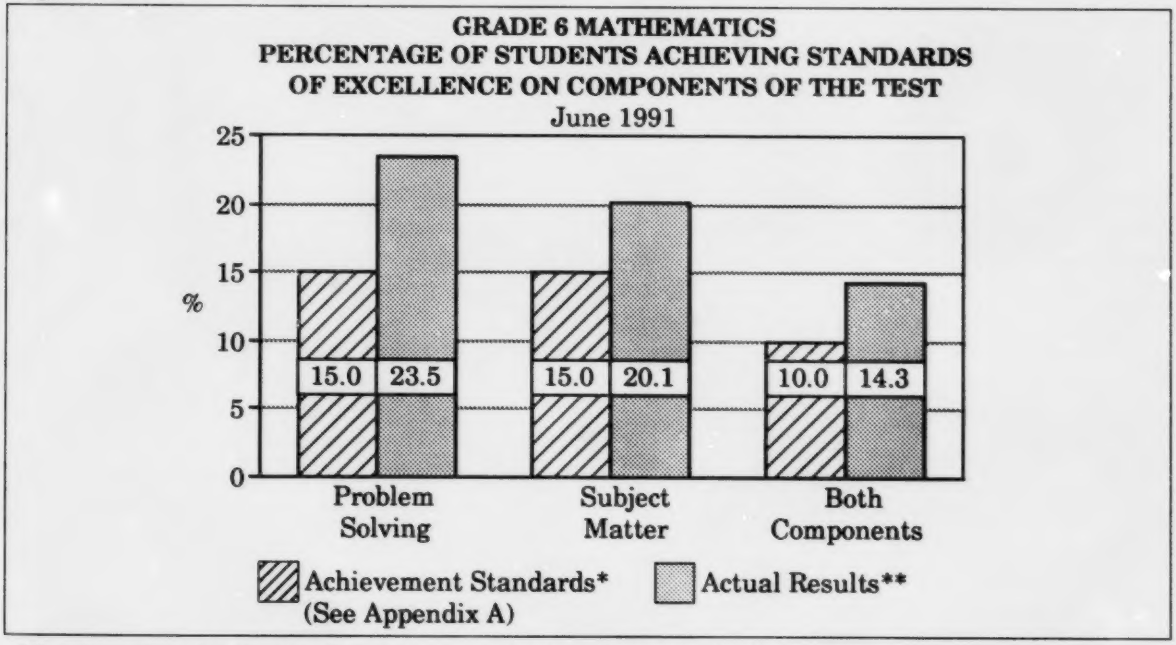
Figures 3-1 and 3-2 and Table 3-4 show the percentage of students achieving the acceptable standards and the standards of excellence on components of the test. The levels of performance were higher than expected for the standards of excellence but lower than expected for the acceptable standards.

Figure 3-1



*the percentage of students in the province expected to meet the acceptable standards or higher
**the percentage of students in the province who met the acceptable standards or higher

Figure 3-2



*the percentage of students in the province expected to meet the standards of excellence
**the percentage of students in the province who met the standards of excellence

Table 3-4
Grade 6 Mathematics: Booklets 1 and 2
Students Achieving Standards on Components of the Test
June 1991

Reporting Category	Maximum Possible Score	Provincial Assessment Standard* (Raw Score)	Provincial Achievement Standard** (Per Cent)	Expected Number	Actual Number	Actual Per Cent
Standard of Excellence						
Both Major Components***	25 + 30	21 + 27	10	3 193	4 572	14.3
Problem Solving Only	25	21	15	4 789	7 508	23.5
Subject Matter Only	30	27	15	4 789	6 426	20.1
Acceptable Standard or Higher						
Both Major Components***	25 + 30	13 + 17	80	25 544	22 004	68.9
Problem Solving Only	25	13	85	27 140	24 088	75.4
Subject Matter Only	30	17	85	27 140	24 457	76.6
Below Acceptable Standard on Both Components	N/A	N/A	N/A	N/A	5 389	16.9

* The Provincial Assessment Standard is a score determined by appropriate standard-setting procedures and is the lowest score students must achieve for their performance to be judged "acceptable" and/or "excellent" in relation to curricular expectations. See Appendix A.

**The Provincial Achievement Standard refers to the percentage of students expected to meet or exceed the Provincial Assessment Standard. See Appendix A.

***In previous years, a standard for the total test was reported. An individual could meet the standard for the test overall but might not achieve the standard for both components of the test. The new method of reporting allows for a more meaningful interpretation of the results. To allow comparison with results from previous years, the total test score is reported in Table 3-5.

Table 3-5 shows the percentage of students achieving the *acceptable standard* and the *standard of excellence* on the total test. These levels of performance were higher than expected for the *standard of excellence* but were lower than expected for the *acceptable standard*.

Table 3-5
Grade 6 Mathematics: Booklets 1 and 2
Students Achieving Standards on the Total Test
June 1991

Reporting Category	Maximum Possible Score	Provincial Assessment Standard* (Raw Score)	Provincial Achievement Standard** (Per Cent)	Expected Number	Actual Number	Actual Per Cent
Total Test:						
Standard of Excellence	55	48	15	4 789	6 566	20.6
Acceptable Standard or Higher	55	30	85	27 140	24 118	75.5

*The Provincial Assessment Standard is a score determined by appropriate standard-setting procedures and is the lowest score students must achieve for their performance to be judged "acceptable" and/or "excellent" in relation to curricular expectations. See Appendix A.

**The Provincial Achievement Standard refers to the percentage of students expected to meet or exceed the Provincial Assessment Standard. See Appendix A.

It should be noted that the actual percentages for Grade 3 Mathematics (20.6 and 75.5) are based on the 31 930 students in the regular programs who wrote the test.

If, however, the percentages are based on the total population reported by principals (36 565), less the French Immersion and Francophone students who wrote the test (1 884), the percentages would be:
18.9% achieving the standard of excellence
69.5% achieving the acceptable standard

If the percentages are based on the September 30, 1990, Grade 6 enrolment (37 114), less the French Immersion and Francophone students who wrote the test (1 884), the percentages would be:
18.6% achieving the standard of excellence
68.5% achieving the acceptable standard

It is emphasized that the above percentages, based on the total population and enrolment, present the worst possible scenario. It is highly unlikely that none of the students who was absent, exempt, or not accounted for would have achieved standards. The absence of information on these students is nonetheless problematic.

The number of students achieving the *acceptable standard* and the *standard of excellence* for each jurisdiction were analysed to determine whether jurisdictions were below, meeting, or exceeding provincial achievement standards. Jurisdictions classified as meeting provincial achievement standards were those for which the difference between the actual number of students and the expected number of students at or above standards was not statistically significant. A 95% confidence interval was used; this criterion means that differences are only reported when there is a 5% or smaller probability that a difference of that size could occur by chance. The results are reported in tables 3-6 and 3-7. ***The percentages in the tables are based on 202 jurisdictions (including private schools).***

Table 3-6
Grade 6 Mathematics: Booklets 1 and 2
Percentage Distribution of Jurisdictions* Meeting Provincial Achievement Standards on Components of the Test

June 1991

Component	Jurisdictions Not Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Exceeding Provincial Achievement Standard (Per Cent)
Standard of Excellence			
Both Major Components	3.0	73.2	23.8
Problem Solving Only	2.0	59.9	38.1
Subject Matter Only	5.4	69.8	24.8
Acceptable Standard or Higher			
Both Major Components	57.9	40.1	2.0
Problem Solving Only	54.4	44.6	1.0
Subject Matter Only	51.0	47.5	1.5

Table 3-7
Grade 6 Mathematics: Booklets 1 and 2
Percentage Distribution of Jurisdictions* Meeting Provincial Achievement Standards on the Total Test

June 1991

Reporting Category	Jurisdictions Not Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Exceeding Provincial Achievement Standard (Per Cent)
Total Test:			
Standard of Excellence	4.0	69.8	26.2
Acceptable Standard or Higher	56.4	42.6	1.0

*Jurisdictions with fewer than six students are excluded because the statistical significance of the difference between the number actually meeting the standard and the number expected to meet the standard when calculated and reported is not educationally meaningful.

REPORTING CATEGORIES

Table 3-8 shows the total marks possible and the provincial raw score results for the reporting categories of Booklets 1 and 2 of the Grade 6 Mathematics Achievement Test.

It is important to stress that the averages on the various reporting categories cannot be directly compared with one another. Rather, the results shown in Table 3-8 can best be used in conjunction with parallel tables in the jurisdiction and school reports. Variations in patterns of students' responses to questions can help to indicate strengths and weaknesses in local educational programs.

Statistics presented in this table are based on results achieved by 29 768 students (those who wrote the regular form and those who wrote Form B).

Table 3-8
Grade 6 Mathematics: Booklets 1 and 2
Raw Score Results by Reporting Category
June 1991

Reporting Category	Maximum Possible Score	Raw Score Average	Raw Score Standard Deviation
Total Test	55	37.5	10.6
Major Component:			
Problem Solving	25	16.4	5.3
Subject Matter	30	21.0	5.8
Curricular Elements:			
Numeration	13	8.1	3.2
Operations and Properties	16	11.6	3.4
Measurement	11	7.0	2.5
Geometry	6	4.5	1.3
Graphing	6	4.2	1.4
Problem-Solving Strategies	3	2.1	0.9
Cognitive Level:			
Knowledge	12	8.7	2.6
Comprehension	19	12.9	3.9
Application/Problem Solving	24	15.8	4.9

Percentage of Students Choosing Each Alternative

Table 3-9 shows the percentage of students who chose each alternative (A, B, C, and D) for each multiple-choice question. The correct response (key) for each question is also identified. The results shown in Table 3-9 can best be used in conjunction with the parallel tables in the jurisdiction and school reports. Variations in patterns of students' responses to questions can help to indicate strengths and weaknesses in local educational programs.

Statistics presented in this table are based on results achieved by 29 768 students (those who wrote the regular form and those who wrote Form B).

Table 3-9
Grade 6 Mathematics: Booklets 1 and 2
Provincial Results for Individual Multiple-Choice Questions*
June 1991

		Distribution of Responses (%)						Distribution of Responses (%)			
Item	Key	A	B	C	D	Item	Key	A	B	C	D
1	B	6.7	79.9	7.8	5.3	29	B	20.0	48.9	7.1	23.9
2	C	3.1	5.1	73.8	17.6	30	B	4.9	79.6	11.3	4.0
3	B	16.8	69.4	10.0	3.7	31	A	61.0	6.2	4.8	27.5
4	D	14.0	26.3	7.0	52.3	32	C	8.5	11.4	65.7	14.1
5	A	63.8	9.4	14.1	12.5	33	A	62.6	17.1	11.8	8.1
6	C	2.4	13.9	60.9	22.5	34	A	90.2	4.5	3.4	1.6
7	A	71.6	12.1	12.2	3.8	35	C	13.3	22.7	50.1	13.5
8	A	78.3	2.8	14.2	4.4	36	A	63.4	18.3	11.2	6.6
9	B	1.4	90.6	5.7	2.1	37	A	60.8	3.8	32.6	2.6
10	A	78.5	7.4	3.9	9.8	38	C	6.0	13.5	70.3	10.0
11	C	7.7	17.0	47.1	28.0	39	B	4.5	60.5	31.0	3.9
12	C	8.0	4.6	82.6	4.6	40	C	8.8	7.6	75.7	7.6
13	B	6.3	74.5	15.2	3.8	41	B	2.2	69.5	23.3	4.8
14	A	43.2	2.1	37.7	16.7	42	D	8.3	7.9	9.7	73.7
15	D	7.4	9.6	41.9	41.0	43	D	2.3	13.5	9.7	74.2
16	D	9.9	10.1	10.0	69.6	44	A	88.8	5.7	2.6	2.5
17	B	9.4	72.4	10.6	7.1	45	D	26.0	4.7	8.0	61.2
18	B	4.4	78.0	12.7	4.7	46	C	2.7	5.3	86.8	4.9
19	D	32.4	9.1	6.0	52.0	47	B	8.0	69.0	11.2	11.5
20	D	2.5	4.1	5.4	87.8	48	C	7.8	8.1	79.0	4.9
21	B	4.5	88.8	3.1	3.5	49	D	3.4	4.7	6.8	84.6
22	D	4.9	37.5	8.2	49.3	50	C	13.1	13.5	60.5	12.5
23	A	76.2	15.0	4.2	4.3	51	B	26.6	60.2	11.8	1.1
24	B	3.8	63.1	25.6	7.4	52	B	6.1	44.7	16.9	32.0
25	D	7.0	12.4	13.1	67.4	53	C	8.3	6.0	61.6	23.9
26	C	3.9	17.9	73.9	4.1	54	A	58.5	18.4	14.4	8.1
27	D	7.4	6.2	8.8	77.5	55	C	3.7	16.7	71.2	8.0
28	C	4.5	16.9	50.7	27.5						

*The sum of the percentages for each question may be less than 100% because the No Response category is not included. This category is less than 1% for any one of these questions.

RESULTS FOR BOOKLET 3: NUMBER FACTS

This section of the test measured student performance in operations in addition, subtraction, multiplication, division, and mixed operations; that is, it measured student speed and accuracy.

Figure 3-3 and Table 3-10 present the results in terms of the average number of the 48 questions students attempted to answer in two minutes and the average number of questions students answered correctly in two minutes.

Statistics presented in this table are based on results achieved by 31 930 students (those who wrote the regular form and those who participated in the achievement-over-time study).

Figure 3-3

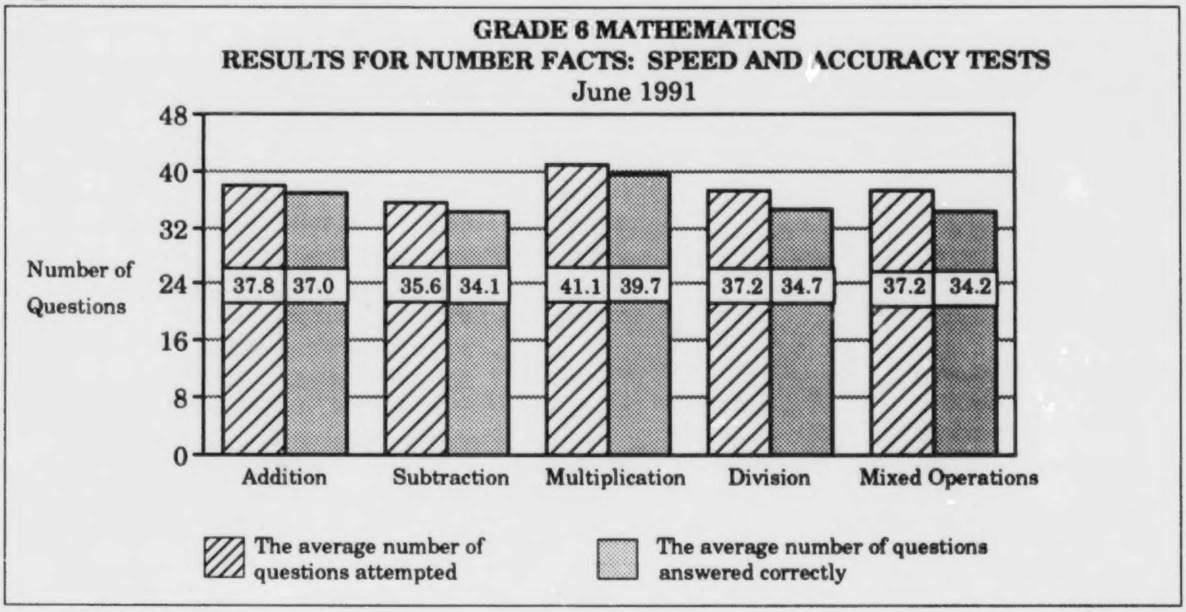


Table 3-10
Grade 6 Mathematics
Results for Number Facts: Speed and Accuracy Tests
June 1991

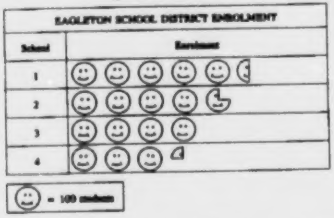
Operations	Time Allotted in Minutes	Number of Questions	Average Number Attempted	Average Number Correct
Addition	2	48	37.8	37.0
Subtraction	2	48	35.6	34.1
Multiplication	2	48	41.1	39.7
Division	2	48	37.2	34.7
Mixed Operations	2	48	37.2	34.2

GRADE 6 MATHEMATICS EXAMINER'S OBSERVATIONS

The following is a discussion of specific areas of strength and of difficulty for Grade 6 students. Sample questions are provided to highlight the strengths and weaknesses of students achieving at the acceptable standard and at the standard of excellence. For each sample question, the correct answer is marked with an asterisk. The percentage of students choosing each alternative is also provided.

Acceptable Standard—Sample Questions and Commentary

Use the chart below to answer question 21.



21. What is the TOTAL enrolment of ALL the schools in the Eagleton School District?

4.5 A. 1725 students
88.8 *B. 1750 students
3.1 C. 1775 students
3.5 D. 1800 students

Question 21 required students to read a simple chart and then apply a one-step problem-solving strategy to a real-life situation.

12. Which group of symbols represents standard units of measure from SMALLEST to LARGEST?

8.0 A. dm, cm, m
4.6 B. hm, km, mm
82.6*C. cm, m, km
4.6 D. mm, km, m

Question 12 required students to recognize units of measure and to apply a routine procedure.

Generally, the Grade 6 teachers who analysed the standards built into the test felt that the test reflected the nature of the Grade 6 Mathematics program. As well, these teachers felt that the provision of a section in which calculators were permitted was consistent with the NCTM Standards and with the philosophy and rationale of the role of technology in the *Elementary Mathematics Curriculum Guide*, 1982. The teachers also felt that because the program has been in operation for almost 10 years, the test items were predictable; in other words, there were no surprises in the content of the test.

General Statement on Student Performance

Overall, students were able to solve one-step problems, complete routine operations, and apply their knowledge to straightforward problem-solving questions. As well, students showed a knowledge of and an ability to use basic measurement skills.

Listed below are some areas where students performing at the acceptable standard and beyond showed a strong grasp of mathematics.

Grade 6 students could do the following:

- read simple charts and graphs (see question 21)
- recognize place value, parallel lines, congruency, problem-solving stages, co-ordinates, ordered pairs, and units of measure and equivalencies (see question 12)
- use routine procedures and operations in addition, subtraction, multiplication, division, and estimation (see question 46)
- apply simple one-step problem-solving strategies to real-life situations (see question 21).

46. 9 $\overline{)4321}$ equals

2.7 **A.** 318 R1
5.3 **B.** 329 R2
86.8***C.** 480 R1
4.9 **D.** 491 R2

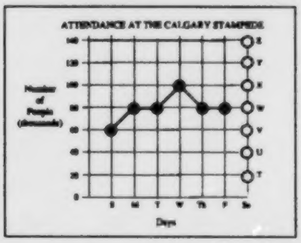
Question 46 required students to perform a routine procedure in division.

However, students could not do the following well enough:

- **complete multistep problems**
- **transfer knowledge to new or real-life problem-solving situations**
- **understand which operations to use when solving problems.**

Standard of Excellence—Sample Questions and Commentary

Use the graph below to answer question 24.



24. The graph shows the attendance at the Calgary Stampede for one week. Saturday's attendance was DOUBLE that of Sunday's. Which circle should be filled in to show Saturday's attendance?

3.8 **A.** Z
63.1 ***B.** Y
25.6 **C.** X
7.4 **D.** V

Question 24 required students to read and interpret a graph, and to apply a multistep problem-solving strategy to a real-life situation.

11. 1 m + 4 cm + 2 mm equals

7.7 **A.** 10 402 mm
17.0 **B.** 1 402 mm
47.1***C.** 1 042 mm
28.0 **D.** 142 mm

Question 11 required students to manipulate mixed units.

Use the information below to answer question 53.

A cross-country skier goes 3 kilometres in 15 minutes.

53. At this rate, how long will it take the skier to go 15 km?

8.3 **A.** 150 min
6.0 **B.** 90 min
61.6***C.** 75 min
23.9 **D.** 45 min

Question 53 required students to apply ratios to a multistep problem using a real-life situation.

Students who achieved at the standard of excellence demonstrated more success and understanding in solving symbolic and multistep problems than other students did. Specifically, those students achieving at the standard of excellence could do the following:

- **demonstrate an understanding of equivalent fractions and place value in a problem-solving setting**
- **recognize flips, slides, and cylinder construction**
- **read and interpret graphs in problem-solving situations (see question 24)**

- manipulate mixed units, arrange integers, calculate averages, add decimals, convert fractions to decimals, apply ratios, and find area, volume, and perimeter (see questions 11 and 53)
- apply more complex multistep problem-solving strategies to real-life situations (see questions 24 and 53).

These students generally showed strengths in all areas that were assessed.

New Features of the Test

The introduction of a calculator and of the "cluster" questions on the June 1991 Grade 6 Mathematics Achievement Test was well accepted by most teachers. Teachers remarked that the test could have been done without using a calculator; therefore, students without calculators were not disadvantaged. Teachers noted that more than adequate time was provided for students to complete Booklet 1 and Booklet 2.

Issues

Some teachers and students felt that not enough time was provided to complete the five timed tests. These tests are designed to test only speed and accuracy with number facts. To do this, a time element is built in to the tests to discriminate between students who know the number facts and those who do not.

Concluding Comments

Overall, the results showed that not enough students performed at the acceptable standard and that a larger number of students than expected performed at the standard of excellence. In other words, although some students are achieving very well, **most** students are not learning mathematical concepts and skills well enough. From a careful consideration of the questions that students found difficult, it seems that students lack **understanding** in some of the concepts and their applications to real-life situations. Students need more work and time with manipulatives at the concrete level to help them understand abstract concepts. Further, an increased emphasis on problem solving in a variety of contexts would help students connect their newly acquired mathematical concepts to real-life situations.

SECTION 4
GRADE 9 SOCIAL STUDIES

GENERAL DESCRIPTION

The Grade 9 Social Studies Achievement Test had two parts. Part A consisted of 60 multiple-choice questions worth 70% of the total test mark. These questions assessed students' knowledge as well as their understanding and application of process skills.

Part B consisted of one written-response question worth 30% of the total mark. Papers were scored on two dimensions: Support of Position, worth 20%, and Expression, worth 10%.

The total writing time for the test was 1 3/4 hours. The questions on the test were organized into two components:

- Knowledge (facts, concepts, generalizations)
- Process Skills

Statistics for total test and for components were based on the results achieved by 27 646 students (24 720 wrote the regular form, and 2 926 participated in the achievement-over-time study, as shown in Table 4-3). This section of the report answers the following questions:

- How many Grade 9 students wrote each form of the test or were absent and exempt?
- What percentage of Grade 9 students attained the acceptable standard in Social Studies according to provincial criteria?
- What percentage of Grade 9 students attained the standard of excellence in Social Studies according to provincial criteria?
- What did Grade 9 students know and what could they do in Social Studies?
- What parts of the Social Studies curriculum caused Grade 9 students difficulty?

SUMMARY OF RESULTS

RESULTS IN RELATION TO STANDARDS

Results show that 67.9% of students who wrote the test achieved the *acceptable standards* on both components and 5.1% achieved the *standards of excellence* on both components. The results were lower than expected.

AVERAGE SCORE

The average total test score was 60.5% with a standard deviation of 15.2.

CONTENT OF THE TEST

The test was based on the 1989 Alberta Social Studies *Program of Studies*. The test measured two major components:

- Knowledge (facts, concepts, generalizations)
- Process Skills

All questions were drawn from the content of the three topics prescribed for Grade 9:

- Topic A: Economic Growth: U.S.A.
- Topic B: Economic Growth: U.S.S.R.
- Topic C: Canada: Responding to Change

The multiple-choice section of the test covered all three topics and had 33 per cent emphasis on the knowledge component and 37 per cent emphasis on the process skills component.

The written-response portion assessed students' communication skills. Therefore, the total emphasis was on process skills. The assignment presented to students related to Topic C: Canada: Responding to Change.

ACHIEVEMENT TEST BLUEPRINT

The test blueprint for *Part A: Multiple Choice* shows the distribution of questions according to the curricular content area (topic) being assessed and according to the knowledge and process skill objectives called for by the question.

Table 4-1
Grade 9 Social Studies
Achievement Test Blueprint
Part A: Multiple Choice
June 1991

	Topic/ Concept Reporting Categories	Topic A Economic Growth: U.S.A.			Topic B Economic Growth: U.S.S.R.				Topic C Canada: Responding To Change			Propo tion o Total Score
	Objective Reporting Categories	Industrialization	Market Economy	Quality of Life	Geography	Industrialization	Centrally Planned Economy	Quality of Life	Technology	Mixed Economy	Quality of Life	
Knowledge Objectives	Understands generalizations, concepts, related concepts, terms, and facts	1, 2, 3, 19	10, 12, 17	13, 15,	25	22, 23, 24, 32	29, 30	36, 37, 38	44, 49, 50, 51	43, 46, 52	55, 58	33
Process Skill Objectives	Locating, interpreting, and organizing	7	4, 6, 16	20	21	40	27, 28	33	41, 42	54, 56, 57, 60		18.5
	Analysing, synthesizing, and evaluating	8, 9	5, 11, 18	14		26, 31	34, 35	39	47, 48, 53	59	45	18.5
	Proportion of Total Score	8%	10%	5%	2%	8%	7%	6%	11%	10%	3%	70%
		23.3%			23.3 %				23.3%			

The test blueprint for *Part B: Written Response* shows the writing assignment presented to students and the emphasis of communication that was assessed.

Table 4-2
Grade 9 Social Studies
Achievement Test Blueprint
Part B: Written Response
June 1991

Writing Assignment	Reporting Category	Proportion of Score
Recycling is a growing concern in Alberta. **HOW SHOULD THE GOVERNMENT OF ALBERTA BE INVOLVED IN RECYCLING PROGRAMS?** In presenting your opinion, consider economic and environmental factors. Your written response may take the form of a letter to the government, a speech to your class, a newspaper editorial, or a position paper. To support your opinion, use examples and evidence from the Information to Consider on page 25 of the test booklet, as well as from YOUR KNOWLEDGE OF ECONOMIC SYSTEMS.	1. **Support of Position:** Students are expected to support their position by organizing their points of argument convincingly, and by using specific and pertinent examples and details to illustrate their points of argument.	20%
	2. **Expression:** Students are expected to express their ideas and arguments with clear, specific, accurate language, and to use correct conventions of spelling, punctuation, and grammar.	10%

STUDENT PARTICIPATION

In June 1991, principals reported a total population of 32 553 students in Grade 9. Table 4-3 presents the number and percentage distribution of students who wrote the Grade 9 Social Studies Achievement Test, who were absent, and who were exempted. Results for students in French Immersion or Francophone programs are reported separately to participating schools and jurisdictions.

Table 4-3
Grade 9 Social Studies
Student Participation
June 1991

Category	Number of Students	Percentage of Students
Total Number of Students in Regular Programs*	27 646	84.9
Students Who Wrote the Regular Form**	24 720	75.9
Students Who Wrote the Achievement-Over-Time Forms:	2 926	9.0
Form R (Red—Same as the Regular Form	*989*	*3.0*
Form T (Turquoise)	*973*	*3.0*
Form C (Charcoal)	*964*	*3.0*
Other Students Who Wrote:* **	1 573	4.8
Francophone Students—Wrote in French	152	0.5
Francophone Students—Wrote in English	0	0.0
French Immersion Students—Wrote in French	904	2.8
French Immersion Students—Wrote in English	0	0.0
Language-of-Testing Students—Wrote in French	258	0.8
Language-of-Testing Students—Wrote in English	259	0.8
Students Absent	1 647	5.1
Students Exempted from Writing	1 687	5.2
Categories of Exemption:		
1. Special Needs Students	796	2.4
2. Subject Was Not Taught This Term	454	1.4
3. ESL Students	352	1.1
4. Language of Instruction Was Not English	0	0.0
5. Other (as approved by the Superintendent)	85	0.3
Total Principals' Reported Population: Test Day, June 1991	32 553	100.0
Grade 9 Enrolment: September 30, 1990	35 512	

* Provincial results are based on test scores achieved by students who were in the "regular" (Mathematics or Science or Social Studies) programs. Such students are defined as those who were instructed in English and wrote the English form of the achievement test, and those students who were instructed in a language other than English or French and wrote the English form of the test. These students are indicated by the shaded area of the table.

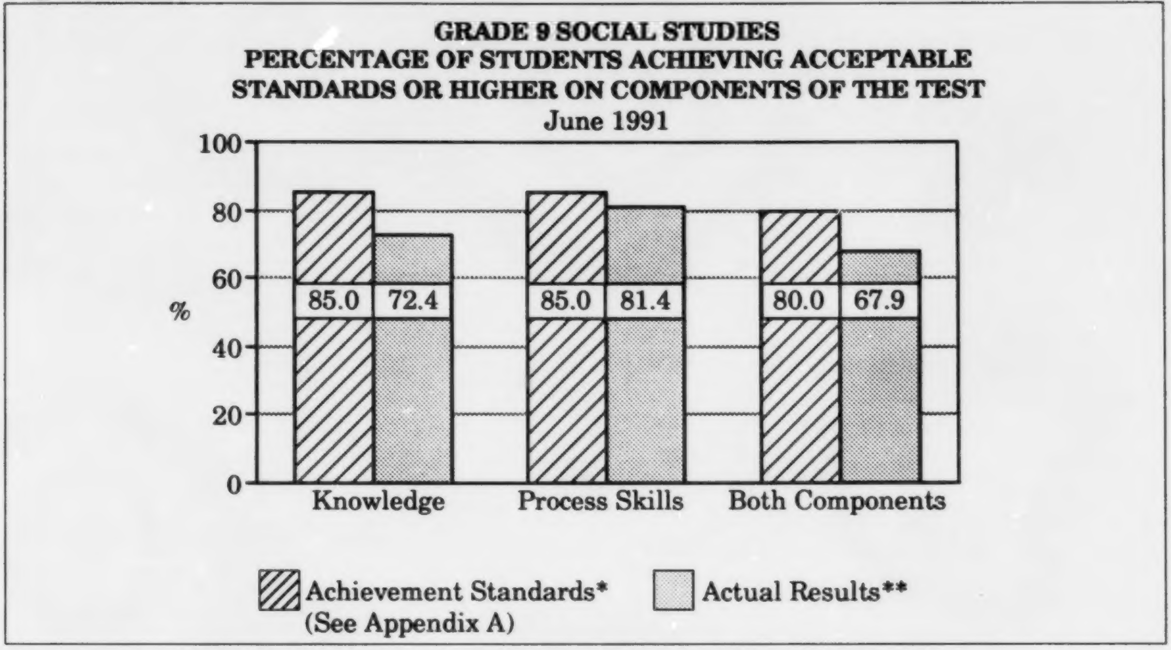
** Regular Form refers to the unmodified 1991 test. The modified tests are described in Section 8 of this report.

*** Results for Francophone or French Immersion students or for students participating in the language-of-testing study are reported directly to participating schools and jurisdictions and are not calculated in the provincial results.

RESULTS IN RELATION TO STANDARDS

Figures 4-1 and 4-2 and Table 4-4 show the percentage of students achieving the *acceptable standards* and the *standards of excellence* on components of the test. The levels of performance were lower than expected for the *acceptable standards* as well as for the *standards of excellence*.

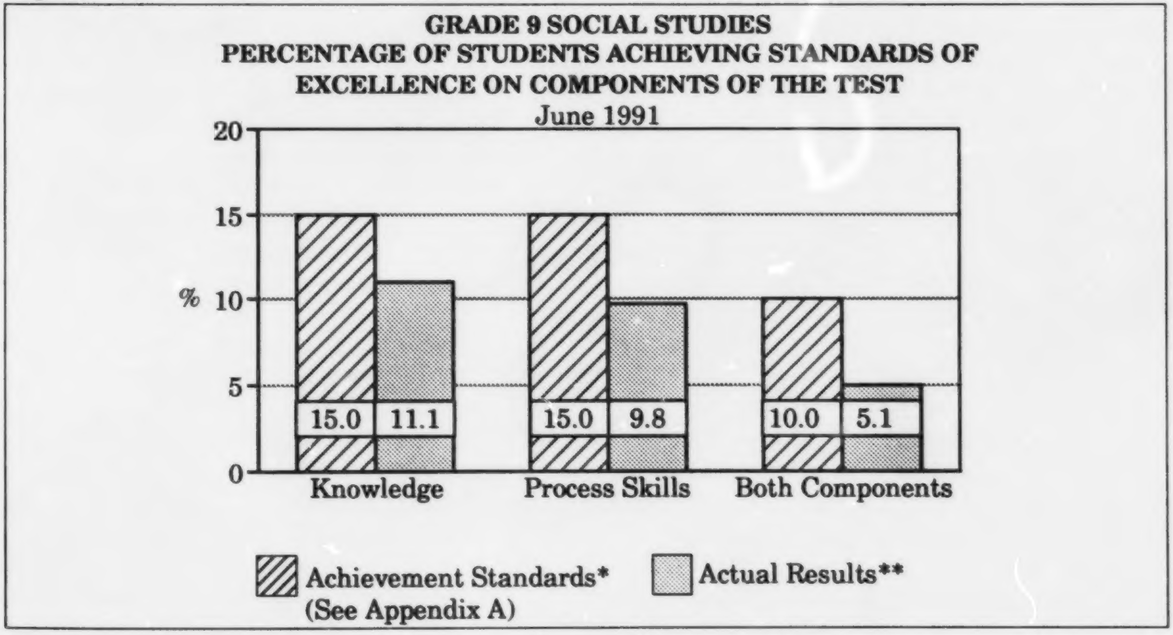
Figure 4-1



GRADE 9 SOCIAL STUDIES
PERCENTAGE OF STUDENTS ACHIEVING ACCEPTABLE STANDARDS OR HIGHER ON COMPONENTS OF THE TEST
June 1991

*the percentage of students in the province expected to meet the acceptable standards or higher
**the percentage of students in the province who met the acceptable standards or higher

Figure 4-2



GRADE 9 SOCIAL STUDIES
PERCENTAGE OF STUDENTS ACHIEVING STANDARDS OF EXCELLENCE ON COMPONENTS OF THE TEST
June 1991

*the percentage of students in the province expected to meet the standards of excellence
**the percentage of students in the province who met the standards of excellence

Table 4-4
Grade 9 Social Studies
Students Achieving Standards on Components of the Test
June 1991

Reporting Category	Maximum Possible Score	Provincial Assessment Standard* (Raw Score)	Provincial Achievement Standard** (Per Cent)	Expected Number	Actual Number	Actual Per Cent
Standard of Excellence						
Both Major Components***	33 + 67	29 + 53	10	2 765	1 402	5.1
Facts, Concepts, Generalizations Only	33	29	15	4 147	3 081	11.1
Process Skills Only	67	53	15	4 147	2 711	9.8
Acceptable Standard or Higher						
Both Major Components***	33 + 67	17 + 31	80	22 117	18 774	67.9
Facts, Concepts, Generalizations Only	33	17	85	23 499	20 027	72.4
Process Skills Only	67	31	85	23 499	22 495	81.4
Below Acceptable Standard on Both Components	N/A	N/A	N/A	N/A	3 898	14.1

*The Provincial Assessment Standard is a score determined by appropriate standard-setting procedures and is the lowest score students must achieve for their performance to be judged "acceptable" and/or "excellent" in relation to curricular expectations. See Appendix A.

**The Provincial Achievement Standard refers to the percentage of students expected to meet or exceed the Provincial Assessment Standard. See Appendix A.

***In previous years, a standard for the total test was reported. An individual could meet the standard for the test overall but might not achieve the standard for both components of the test. The new method of reporting allows for a more meaningful interpretation of the results. To allow comparison with results from previous years, the total test score is reported in Table 4-5.

Table 4-5 shows the percentage of students achieving the acceptable standard and the standard of excellence on the total test. These levels of performance were lower than the expectations for both standards.

Table 4-5
Grade 9 Social Studies
Students Achieving Standards on the Total Test
June 1991

Reporting Category	Maximum Possible Score	Provincial Assessment Standard* (Raw Score)	Provincial Achievement Standard** (Per Cent)	Expected Number	Actual Number	Actual Per Cent
Total Test:						
Standard of Excellence	100	82	15	4 147	2 242	8.1
Acceptable Standard or Higher	100	48	85	23 499	21 809	78.9

*The Provincial Assessment Standard is a score determined by appropriate standard-setting procedures and is the lowest score students must achieve for their performance to be judged "acceptable" and/or "excellent" in relation to curricular expectations. See Appendix A.

**The Provincial Achievement Standard refers to the percentage of students expected to meet or exceed the Provincial Assessment Standards. See Appendix A.

It should be noted that the actual percentages for Grade 9 Social Studies (8.1 and 78.9) are based on the 27 646 students in the regular programs who wrote the test.

If, however, the percentages are based on the total population reported by principals (32 553), less the French Immersion and Francophone students who wrote the test (1 573), the percentages would be:

7.2% achieving the standard of excellence
70.4% achieving the acceptable standard

If the percentages are based on the September 30, 1990, Grade 9 enrolment (35 512), less the French Immersion and Francophone students who wrote the test (1 573), the percentages would be:

6.6% achieving the standard of excellence
64.3% achieving the acceptable standard

It is emphasized that the above percentages, based on total population and enrolment figures, present the worst possible scenario.

It is highly unlikely that none of the students who was absent, exempt, or not accounted for would have achieved standards. The absence of information on these students is nonetheless problematic.

The number of students achieving the *acceptable standard* and the *standard of excellence* for each jurisdiction was analysed to determine whether jurisdictions were below, meeting, or exceeding provincial achievement standards. Jurisdictions classified as meeting provincial achievement standards were those for which the difference between the actual number of students and the expected number of students at or above standards was not statistically significant. A 95% confidence interval was used; this criterion means that differences are only reported when there is a 5% or smaller probability that a difference of that size could occur by chance. The results are reported in Tables 4-6 and 4-7. ***The percentages in the tables are based on 200 jurisdictions (including private schools).***

Table 4-6
Grade 9 Social Studies
Percentage Distribution of Jurisdictions* Meeting Provincial Achievement Standards on Components of the Test
June 1991

Component	Jurisdictions Not Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Exceeding Provincial Achievement Standard (Per Cent)
Standard of Excellence			
Both Major Components	32.0	66.3	1.7
Facts, Concepts, and Generalizations Only	27.5	68.6	3.9
Process Skills Only	30.3	67.5	2.2
Acceptable Standard or Higher			
Both Major Components	59.5	38.8	1.7
Facts, Concepts, and Generalizations Only	63.4	36.0	0.6
Process Skills Only	29.8	68.0	2.2

Table 4-7
Grade 9 Social Studies
Percentage Distribution of Jurisdictions* Meeting Provincial Achievement Standards on the Total Test
June 1991

Reporting Category	Jurisdictions Not Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Meeting Provincial Achievement Standard (Per Cent)	Jurisdictions Exceeding Provincial Achievement Standard (Per Cent)
Total Test:			
Standard of Excellence	39.3	59.0	1.7
Acceptable Standard or Higher	39.3	60.1	0.6

*Jurisdictions with fewer than six students are excluded, as the statistical significance of the difference between the number actually meeting the standard and the number expected to meet the standard when calculated and reported is not educationally meaningful.

RESULTS FOR PART A: MULTIPLE CHOICE

Reporting Categories

Table 4-8 shows the total marks possible and the provincial raw score results for the reporting categories of the multiple-choice portion of the Grade 9 Social Studies Achievement Test.

It is important to stress that the averages on the various reporting categories cannot be directly compared with one another. Rather, the results shown in Table 4-8 can best be used in conjunction with parallel tables in the jurisdiction and school reports. Variations in patterns of students' responses to questions can help to indicate strengths and weaknesses in local educational programs.

Statistics presented in this table are based on results achieved by 25 709 students (those who wrote the regular form and those who wrote Form R).

Table 4-8
Grade 9 Social Studies
Raw Score Results by Reporting Category
Part A: Multiple Choice
June 1991

Reporting Category	Number of Questions	Raw Score Average	Raw Score Standard Deviation
Total	60	37.4	10.4
Topic A: Economic Growth: U.S.A.	20	12.6	3.8
Topic B: Economic Growth: U.S.S.R.	20	11.8	3.6
Topic C: Canada: Responding to Change	20	13.0	4.1
Recall of Knowledge: Facts, Concepts, and Generalizations	28	17.9	5.3
Application of Process Skills	32	19.4	5.6
Recall of Knowledge:			
Topic A	9	5.7	2.0
Topic B	10	6.3	2.2
Topic C	9	6.0	2.1
Application of Process Skills:			
Locating, Interpreting, and Organizing	16	9.4	3.0
Analysing, Synthesizing, and Evaluating	16	10.0	3.2

PERCENTAGE OF STUDENTS CHOOSING EACH ALTERNATIVE

Table 4-9 shows the percentage of students who chose each alternative (A, B, C, and D) for each multiple-choice question. The correct response (key) for each question is also identified.

The results shown in Table 4-9 can best be used in conjunction with the parallel tables in the jurisdiction and school reports. Variations in patterns of students' responses to questions can help to indicate strengths and weaknesses in local educational programs.

Statistics presented in Table 4-9 are based on results achieved by 25 709 students (those who wrote the regular form and those who wrote Form R).

Table 4-9
Grade 9 Social Studies
Provincial Results for Individual Multiple-Choice Questions*
June 1991

		Distribution of Responses %						Distribution of Responses %			
Item	Key	A	B	C	D	Item	Key	A	B	C	D
1	A	79.0	13.8	2.9	4.1	31	D	6.5	9.4	26.8	57.1
2	B	9.8	43.9	16.9	29.1	32	B	12.2	70.0	5.2	12.5
3	D	14.7	22.8	3.4	59.0	33	D	15.8	3.4	3.9	76.8
4	A	85.4	4.1	6.4	4.0	34	C	20.1	15.5	51.6	12.7
5	B	27.0	58.6	6.3	8.0	35	A	52.1	17.1	20.9	9.8
6	D	13.8	7.6	21.8	56.6	36	A	53.4	16.0	8.6	21.9
7	C	16.9	4.0	65.4	13.6	37	D	11.5	14.1	20.2	54.0
8	A	65.9	9.3	17.4	7.3	38	B	5.9	77.6	4.9	11.6
9	B	35.1	53.4	5.0	6.3	39	D	14.6	17.6	14.8	52.9
10	D	10.9	10.3	28.1	50.3	40	A	32.0	23.3	29.8	14.7
11	B	22.4	62.1	6.5	8.9	41	D	27.9	5.9	9.4	56.6
12	B	8.7	54.1	28.8	8.1	42	D	28.8	13.4	25.3	32.4
13	C	16.6	14.5	61.8	7.0	43	C	15.2	21.9	52.9	10.0
14	D	11.2	4.6	28.2	55.9	44	B	5.0	56.1	10.6	28.1
15	B	14.1	66.9	8.4	10.4	45	A	60.4	24.1	8.1	7.2
16	A	49.9	12.0	26.0	12.1	46	B	13.9	53.1	18.8	14.1
17	B	5.6	71.9	11.8	10.6	47	C	7.1	10.1	78.0	4.7
18	A	66.1	7.9	15.2	10.7	48	C	7.6	7.7	77.3	7.2
19	C	11.2	7.0	79.3	2.5	49	B	11.7	78.2	4.7	5.2
20	A	72.1	9.4	12.2	6.3	50	B	5.5	66.0	15.2	13.2
21	C	13.2	10.7	64.2	11.7	51	A	73.6	8.5	4.6	13.2
22	B	3.1	69.7	11.3	15.9	52	D	8.4	14.7	23.5	53.3
23	A	49.0	9.7	30.9	10.2	53	C	3.5	6.3	83.9	6.2
24	C	9.1	8.5	69.2	13.1	54	B	6.7	64.5	13.2	15.5
25	B	11.6	53.5	14.3	20.3	55	A	89.8	2.5	3.7	3.9
26	D	20.6	8.4	16.5	54.3	56	A	52.8	11.2	19.6	16.2
27	B	12.3	50.1	9.5	28.0	57	D	19.5	33.6	6.5	40.2
28	C	11.3	4.4	67.1	17.1	58	C	4.0	14.5	78.3	3.1
29	A	47.9	13.9	28.5	9.3	59	B	7.8	70.1	14.8	7.2
30	A	81.5	6.4	8.2	3.8	60	A	78.3	4.8	5.9	10.9

*The sum of the percentages for each question may be less than 100% because the No Response category is not included. This category is less than 1% for any one of these questions.

RESULTS FOR PART B: WRITTEN RESPONSE

Results for *Part B: Written Response* are most clearly understood in the context of the assignment students responded to and in the context of the scoring guides. The average raw score for written response was 17.0 out of a possible 30, with a standard deviation of 5.2. Complete scoring guides are available from the Student Evaluation Branch, Alberta Education.

All schools should have extra copies of the *Part B: Written Response* test to use in conjunction with information provided in this *Provincial Report*.

SCORING RELIABILITY

Although the papers were scored on a one-marker system, 192 randomly selected papers were re-marked so that a second set of scores was available to confirm scoring consistency. Of the scores awarded on the second reading, 93.5% were identical to the original score on the same scale or varied by only one point. It is important to note that the one-marker system produces results that are reliable for groups of 25 or more students. Achievement test scores, however, are less reliable for individual students.

The results presented in Table 4-10 are best considered in terms of the percentage of students that markers judged to have presented work that was 3 (Acceptable) or higher for any reporting category. It is possible to draw conclusions about local program strengths and weaknesses by comparing local percentages of 3 (Acceptable) or higher scores on each reporting category with the provincial percentages.

Statistics presented in Table 4-10 are based on results achieved by 25 709 students (those who wrote the regular form and those who wrote Form R).

Table 4-10
Grade 9 Social Studies
Part B: Written Response
Percentage Distribution of Written-Response
Scale Points by Scoring Category
June 1991

Scale Point	Support of Position	Expression
5 (Excellent)	3.8	3.7
4 (Good)	15.9	19.1
3 (Acceptable)	42.6	52.6
2 (Limited)	29.0	20.3
1 (Poor)	7.8	3.4
Ins (Insufficient or No Response)	1.0	1.0

GRADE 9 SOCIAL STUDIES EXAMINER'S OBSERVATIONS

MULTIPLE CHOICE

Students found the multiple-choice section of the test very challenging. The following is a discussion of specific areas of strength and of difficulty for Grade 9 students. Sample questions are provided to highlight the strengths and weaknesses of students achieving at the acceptable standard and at the standard of excellence. For each sample question, the correct answer is marked with an asterisk. The percentage of students choosing each alternative is also provided.

Acceptable Standard—Sample Questions and Commentary

38. The most general definition of quality of life is

5.9 A. your job satisfaction
77.6 *B. how happy you are
4.9 C. your level of education
11.6 D. how much money you have

Question 38 required students to have a basic understanding of quality of life. Students achieving at the acceptable standard have a good understanding of this concept. Few students confused quality of life with materialism.

31. President Gorbachev's attempted reforms MOST CLOSELY parallel

6.5 A. Lenin's War Communism
9.4 B. Stalin's collectivization
26.8 C. Stalin's five-year plans
57.1 *D. Lenin's New Economic Policy

Question 31 required students to apply their knowledge of historical events to current reforms in the Soviet Union. Results indicate that students achieving at the acceptable standard were unable to apply their knowledge of economic planning in this question; however, students achieving at the standard of excellence were clearly able to do so.

The strengths of students who demonstrated an acceptable standard of performance include:

- a basic, though limited, understanding of what a centrally planned economy—as in the Soviet Union before 1990—is, of the meaning of quality of life, of primary industry in an economy, and of aspects of one's lifestyle (see question 38)
- an ability to make simple inferences.

Many students achieving at this standard had difficulty

- recalling and applying some basic knowledge as outlined in the course of study (see question 31)
- analysing, synthesizing, and evaluating sources of a more abstract nature.

Standard of Excellence—Sample Questions and Commentary

Use the information below to answer questions 7 and 9.

Source I

Nearly every immigrant wanted to work and this caused tension between American-born workers and newcomers. Part of this conflict resulted from a lack of understanding of the causes of unemployment. Many American-born workers did not understand that they were being displaced because the tremendous changes in manufacturing had caused the mechanization of their jobs.

Source II

American-born workers resented the immigrants, who were willing to work for less money. They grew angry because they felt their demands for higher wages and better working conditions were threatened by immigrants who were eager to work under any conditions. The competition between American-born workers and immigrants became intense as immigration increased and the worker population expanded one-third faster than the total population.

7. The MAIN point in source I is that

16.9 A. immigration led to the mechanization of American industries
4.0 B. workers tended to be more close-minded and racist than other people
65.4 *C. workers lost their jobs to machines but blamed immigration
13.6 D. owners hired more immigrants because they were willing to work for less

Question 7 required students to identify the main point in source I. A fair percentage of students achieving at the acceptable standard were able to identify the main idea, whereas a high percentage of students achieving at the standard of excellence were able to do so.

9. Based on both sources, what generalization can be made about immigration and economic growth?

35.1 A. People move to areas where the economy is expanding.
53.4 *B. Workers often believe that immigration creates unemployment.
5.0 C. More skilled workers than unskilled workers tend to immigrate.
6.3 D. Immigration has lowered profits and slowed the growth of factories.

Question 9 required students to use a higher level cognitive process. They had to select the generalization that could be made based on the two sources. Many students achieving at the acceptable standard and some students achieving at the standard of excellence had problems selecting the correct generalization. Too many students in both groups were drawn to the first alternative.

Students achieving at the standard of excellence could

- readily extract information from a reading passage and use it to support their main idea
- identify an author's point of view in a reading passage (see question 7)
- make judgments using their knowledge of economic growth
- show a clear understanding of the effects of technology; for example, computer use in industry
- show a good understanding of the economic, social, and environmental implications of technology on our way of life.

Students achieving at this standard had difficulty

- interpreting source documents that presented highly abstract ideas and synthesizing the information (see question 9)
- recalling some basic facts and concepts.

WRITTEN RESPONSE

Assignment

> Recycling is a growing concern in Alberta.
>
> **HOW SHOULD THE GOVERNMENT OF ALBERTA BE INVOLVED IN RECYCLING PROGRAMS?**
>
> In presenting your opinion, consider economic and environmental factors.
>
> Your written response may take the form of a letter to the government, a speech to your class, a newspaper editorial, or a position paper.
>
> To support your opinion, use examples and evidence from the Information to Consider on page 25, as well as from YOUR KNOWLEDGE OF ECONOMIC SYSTEMS.

Grade 9 Social Studies
Percentage Distribution of Scores
by Reporting Category for Written Response

SCORE SCALE POINTS	REPORTING CATEGORY	
	Support of Position	Expression
5 (Excellent)	3.8	3.7
4 (Good)	15.9	19.1
3 (Acceptable)	42.6	52.6
2 (Limited)	29.0	20.3
1 (Poor)	7.8	3.4
INS (Insufficient or No Response)	1.0	1.0

*the shaded portion indicates below-standard performance

Although the quality of writing in social studies is better in 1991 than in 1987, not enough students are meeting the acceptable standard. Teachers were disappointed with many of the papers that they marked. The markers' specific observations include the following:

- The majority of students had difficulty focusing on the issue. Writing was general rather than specific.
- A number of students confused the levels of government.
- Most students could state a position but had difficulty communicating ideas in support of their position.
- Students wrote with conviction; their writing indicated a sincere concern for the environment. They believed that government should play an important role in solving recycling problems but that government is not fulfilling this function adequately.
- A small number of clearly excellent papers were written. The quality of thought and expression in these papers far exceeded the expectations for Grade 9 Social Studies.

The Student Evaluation Branch is preparing a booklet comprising samples of the full range of student writing, the standards used in marking, and a discussion of the relative strengths and weaknesses in student writing. Booklets will be sent to schools that have students enrolled in Grade 9.

SECTION 5
ACHIEVEMENT BY GENDER

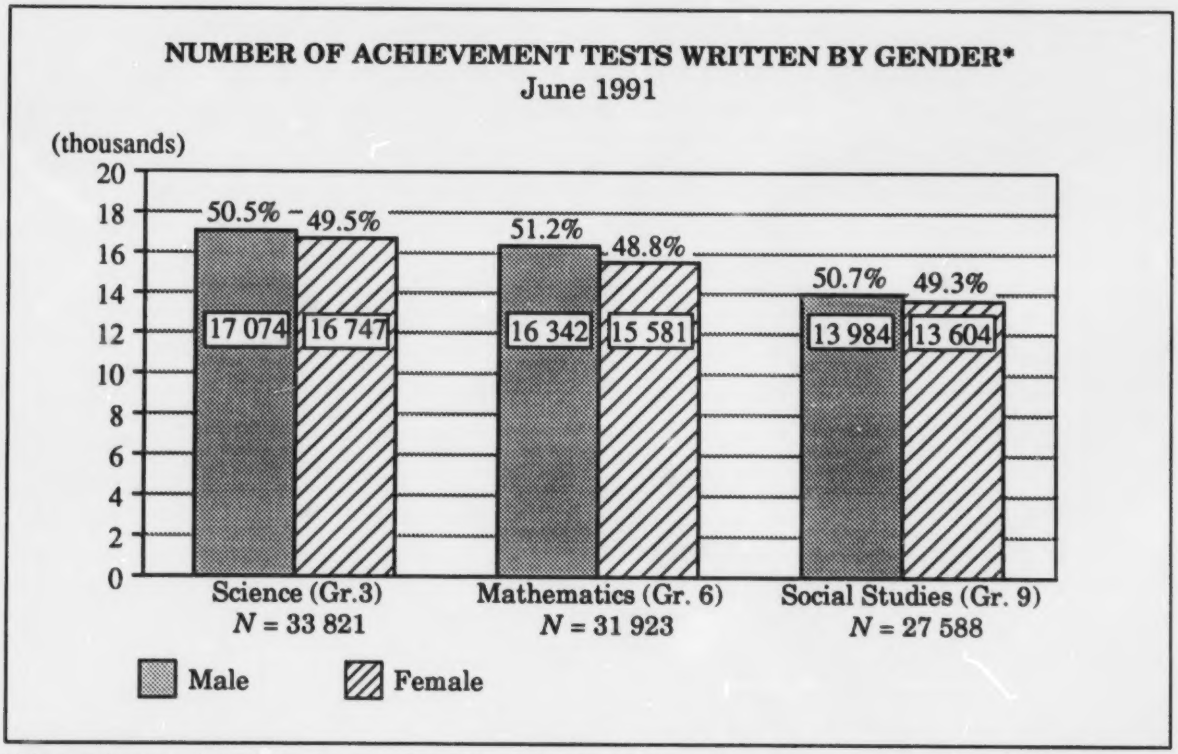
Information on the gender of students who wrote the provincial achievement tests has been collected and data have been analysed and reported since 1989.

For the June 1991 administration, results are presented in Figures 5-1 to 5-3.

This section of the report answers the following questions:

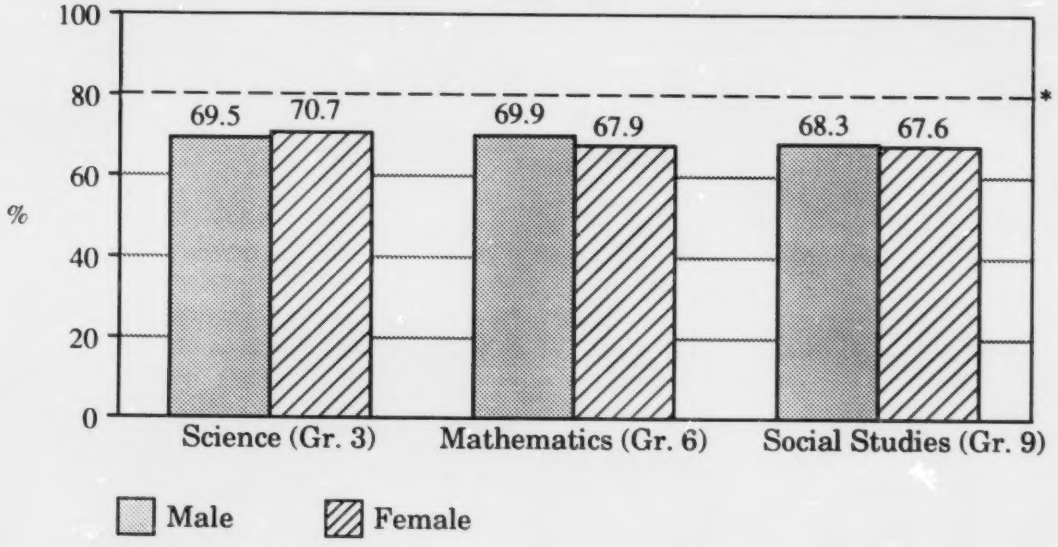
- What is the proportion of males and females who wrote Grade 3 Science, Grade 6 Mathematics, and Grade 9 Social Studies achievement tests in June 1991?
- Is the percentage of males and females meeting standards the same in each subject?
- What is the pattern of male and female achievement across grades 3, 6, and 9?
- Are the 1991 results for individual subjects similar to or different from those of 1989 and 1990?

Figure 5-1



* Figures do not include tests where students did not identify their gender. The number of students who did not provide gender data is as follows:
Grade 3 Science—16 students
Grade 6 Mathematics—7 students
Grade 9 Social Studies—58 students

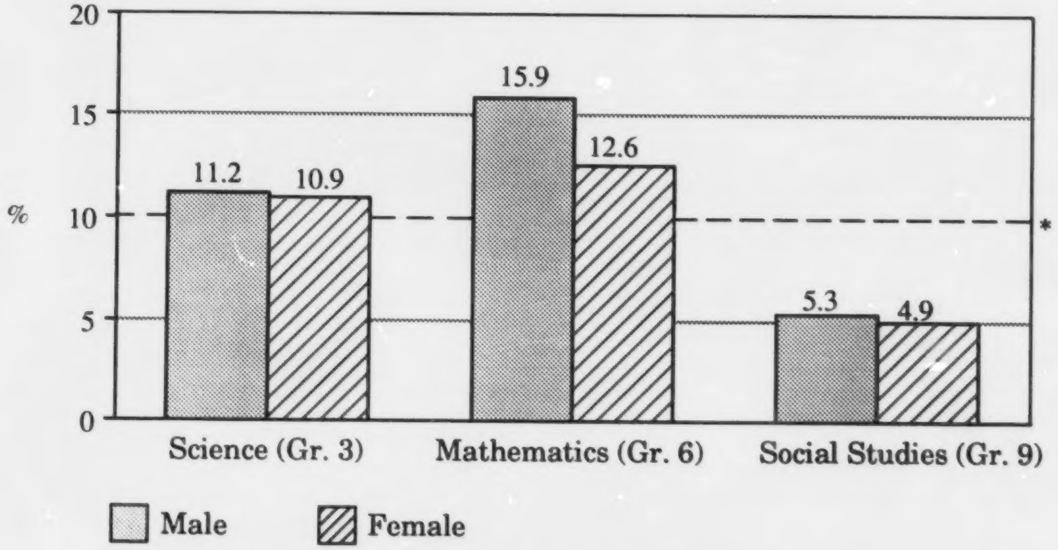
Figure 5-2



PERCENTAGE OF STUDENTS ACHIEVING ACCEPTABLE STANDARDS OR HIGHER ON BOTH COMPONENTS OF THE TESTS BY GENDER
June 1991

*80% of students were expected to achieve the acceptable standards or higher on both components of the test.

Figure 5-3



PERCENTAGE OF STUDENTS ACHIEVING STANDARDS OF EXCELLENCE ON BOTH COMPONENTS OF THE TESTS BY GENDER

*10% of students were expected to achieve the standards of excellence on both components of the test.

OBSERVATIONS AND DISCUSSION

NUMBER OF STUDENTS WRITING THE TESTS

Results for 1991 reveal that more boys than girls wrote the achievement tests at each grade level. The pattern for grades 3 and 6 is supported by the 1989 and the 1990 data. For the Grade 9 data, the proportion of boys and girls changed over time.

In 1989, the number of boys was marginally higher than the number of girls. Then in 1990, the proportions reversed. This change and an explanation of the change in Grade 9 requires further investigation to include absentee rates, enrolments, and age by gender. This information may be used to identify factors that may have contributed to the change.

PERCENTAGE OF STUDENTS ACHIEVING STANDARDS

Results for 1991 reveal that levels of achievement are virtually the same for boys and girls for Grade 3 Science as well as for Grade 9 Social Studies. For Grade 6 Mathematics, boys outperformed girls, particularly for the standard of excellence. The pattern for the Grade 6 Mathematics is supported by the 1990 Grade 3 Mathematics results.

The pattern for the 1991 Grade 3 Science results is not supported by the 1990 Grade 6 Science results or the 1989 Grade 9 Science results, where boys outperformed girls, particularly for the standard of excellence, in both years.

This change in pattern of achievement for boys and girls also exists in social studies, where there is virtually no difference in levels of achievement for boys and girls in the 1991 Grade 9 Social Studies results but Grade 6 girls outperformed boys in 1989.

An explanation of these changes requires further investigation that will include more subjects and more administrations of tests of the same subjects. This will be possible when further data become available in 1992.

SECTION 6
ACHIEVEMENT BY AGE

Information on the age of students who wrote the provincial achievement tests was first collected in June 1990. The 1990 data were analysed and reported in the 1990 *Achievement Testing Program Provincial Report*. Similar information was collected for the June 1991 adminstration. Results are presented in Table 6-1, and Figures 6-1 and 6-2.

This section of the report answers the following questions:

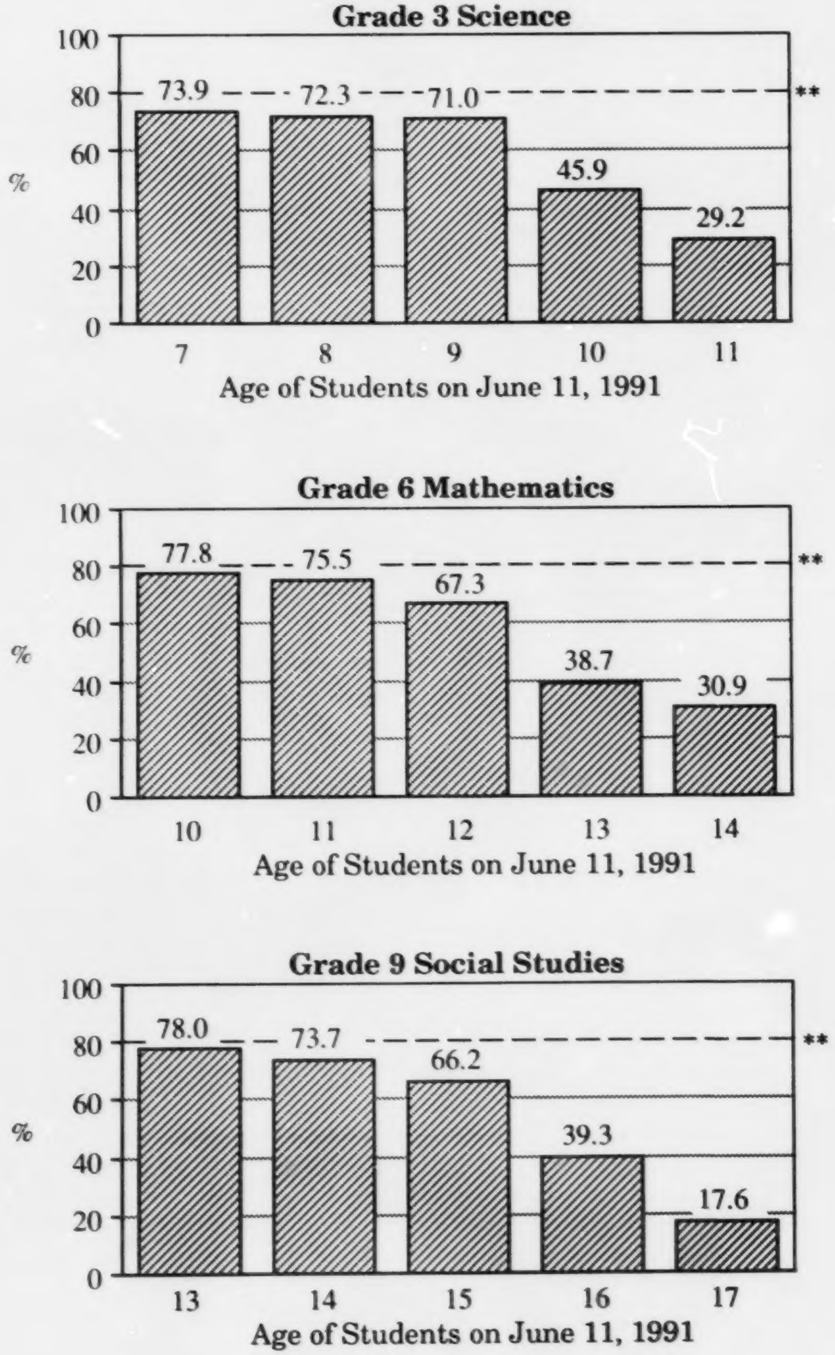
- What is the age distribution of students who wrote the 1991 Achievement Tests?
- What relationship, if any, does age appear to have with achievement as measured by the 1991 provincial achievement tests?
- What changes in age distribution and achievement are evident between the 1991 and the 1990 test results?

Table 6-1
Number of Achievement Tests Written by Age
June 1991

Age* (years)	Grade 3 Science		Grade 6 Mathematics		Grade 9 Social Studies	
	Number	Percentage	Number	Percentage	Number	Percentage
Under 7	4	0.0	—	—	—	—
7	46	0.1	—	—	—	—
8	15 121	44.7	—	—	—	—
9	16 705	49.4	3	0.0	—	—
10	1 780	5.3	54	0.2	—	—
11	89	0.3	14 349	44.9	—	—
12	12	0.0	15 248	47.8	1	0.0
13	3	0.0	2 082	6.5	91	0.3
14	2	0.0	149	0.5	13 007	47.0
15	—	—	15	0.0	12 599	45.6
16	—	—	4	0.0	1 727	6.2
17	—	—	—	—	91	0.3
18	—	—	—	—	11	0.0
Over 18	—	—	—	—	5	0.0
No Age Information	75	0.2	26	0.1	114	0.4
Total	33 837	100.0	31 930	100.0	27 646	100.0

*Age on the test day (June 11, 1991).
The dashes in each column indicate that there were no students.

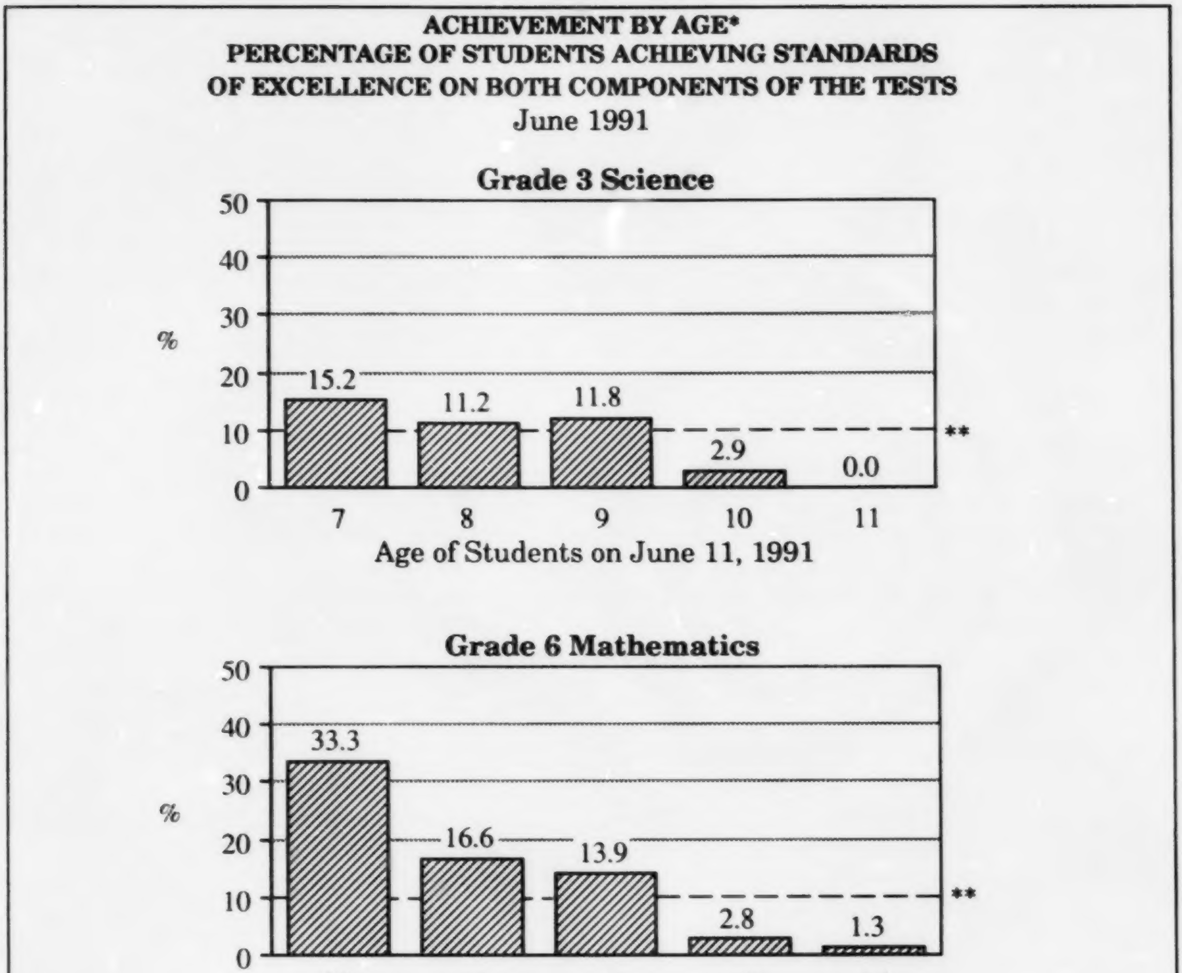
Figure 6-1



ACHIEVEMENT BY AGE*
PERCENTAGE OF STUDENTS ACHIEVING ACCEPTABLE STANDARDS OR HIGHER ON BOTH COMPONENTS OF THE TESTS
June 1991

*Results for groups of fewer than 25 students are not shown on these graphs.
**80% of students were expected to achieve the acceptable standards or higher on both components of the test.

Figure 6-2



*Results for groups of fewer than 25 students are not shown on these graphs.

**10% of students were expected to achieve the standards of excellence on both components of the test.

OBSERVATIONS AND DISCUSSION

AGE GROUPS

The 1991 data reveal that within each grade level, slightly over 90 per cent of students split into two age groups of approximately equal size:

Grade 3: 8-year-olds and 9-year-olds
Grade 6: 11-year olds and 12-year-olds
Grade 9: 14-year olds and 15-year-olds

The 1990 data exhibited the same patterns.

STUDENT ACHIEVEMENT

The 1991 data reveal that there is a high negative relationship between age and student achievement. This means that within a grade level, younger students' achievement is higher than older students' achievement. This is true for both the acceptable standards and the standards of excellence across all three grades. The same patterns and relationships appeared in the 1990 results as well. This lower achievement of older students in the grade levels tested may be attributed to the interaction of several factors. The most likely factors are speculated to be repeating students, late entrants into formal schooling, and transferees from other provinces or countries where there may be curricular differences and/or the language of instruction is not their first language.

Schools and jurisdictions whose results reflect negative relationships similar to the ones exhibited by the provincial results are encouraged to identify the specific factors operating within their own classrooms and schools. Accurate identification of such factors would be the first step in the development of plans to reduce or eliminate this unwelcome relationship.

Student Evaluation Branch welcomes observations from school administrators on the factors they identify as being the major contributors to the prevailing negative relationships between age and achievement.

SECTION 7
ACHIEVEMENT BY GRADE LEVEL

Section 7 is an exploratory approach to reporting results from the 1991 achievement tests.

This section attempts to provide answers to the following question:

> **What percentage of grades 3, 6, and 9 Alberta students**
>
> - **may be achieving beyond grade level**
> - **are achieving at grade level**
> - **may be achieving at grade level**
> - **are not yet achieving at grade level**
>
> **as measured by the June 1991 achievement tests?**

To facilitate implementation of a results-based curriculum, an attempt is made in this section to analyse and report student achievement by "levels".

Within each curriculum, specific outcomes, expressed as the knowledge and skills to be acquired and developed, are arranged into sequences reflecting the developmental nature of learning and expectations for a learner's increasing competence or confidence in the subject area.

As students differ from each other in their rates of learning or development along the continuum, the levels of learning can be considered to be independent of age or the amount of time spent in school.

Additionally, since all students do not necessarily achieve in chronological sequences but learn in different ways, the flexibility of a levels approach allows teachers to focus at all times on the individual needs of students.

In summary, a results-based curriculum is vitally important to the educational process as it allows for and encourages progression while also accommodating individual differences.

The 1991 achievement tests were designed to measure student achievement within the given grade level. However, there were a number of questions on the achievement tests that could be considered to measure more advanced levels of performance. For reporting purposes only, we have classified students within the levels framework, based on the following four definitions:

1. May Be Achieving Beyond Grade Level

Students who may be achieving beyond grade level are those students who achieved the standards of excellence for both major components of the test and correctly answered certain selected questions that assess more advanced levels of performance.

2. Achieving At Grade Level

Students who are achieving at grade level are those students who achieved the acceptable standards for both major components of the test and those students who achieved the standards of excellence but did not answer correctly the selected questions that assess more advanced levels of performance.

3. May Be Achieving At Grade Level

Students who may be achieving at grade level are those students who met the acceptable standard for one of the major components of the test but not for both components.

4. Not Yet Achieving At Grade Level

Students who are not yet achieving at grade level are those students who did not meet the acceptable standard for either major component of the test. These students are not yet considered to be performing at grade level.

Tables 7-1, 7-2, and 7-3 present results from this new analysis for grades 3, 6, and 9 respectively.

Table 7-1
Grade 3 Science Achievement Test
Distribution by Grade Level Achievement
June 1991

Level	Number	Per Cent
Students Who May Be Achieving Beyond Grade 3 Level	1 742	5.1
Students Who Are Achieving At Grade 3 Level	21 970	65.0
Students Who May Be Achieving At Grade 3 Level	5 362	15.8
Students Who Are Not Yet Achieving At Grade 3 Level	4 763	14.1
Total	33 837	100.0

Table 7-2
Grade 6 Mathematics Achievement Test
Distribution by Grade Level Achievement
June 1991

Level	Number	Per Cent
Students Who May Be Achieving Beyond Grade 6 Level	2 319	7.3
Students Who Are Achieving At Grade 6 Level	19 685	61.6
Students Who May Be Achieving At Grade 6 Level	4 537	14.2
Students Who Are Not Yet Achieving At Grade 6 Level	5 389	16.9
Total	31 930	100.0

Table 7-3
Grade 9 Social Studies Achievement Test
Distribution by Grade Level Achievement
June 1991

Level	Number	Per Cent
Students Who May Be Achieving Beyond Grade 9 Level	807	2.9
Students Who Are Achieving At Grade 9 Level	17 967	65.0
Students Who May Be Achieving At Grade 9 Level	4 974	18.0
Students Who Are Not Yet Achieving At Grade 9 Level	3 898	14.1
Total	27 646	100.0

These results quantify the wide range of student achievement within a nominal grade level. The importance of this experimental analysis is that, for the first time, it shows performance in relationship to provincial expectations based on a "levels" curricula approach.

SECTION 8
ACHIEVEMENT OVER TIME

An important goal of Alberta Education is to measure and report changes in student achievement over time. Since 1983, the Student Evaluation Branch has been measuring the achievement of students in grades 3, 6, and 9 in the subject areas of language arts, mathematics, science, and social studies. The administration of the Achievement Testing Program follows a four-year cycle for each subject within each grade level. As a result, in 1983, 1987, and 1991, science was tested in Grade 3, mathematics was tested in Grade 6, and social studies was tested in Grade 9. This section of the report answers the question

- Has achievement as measured by individual provincial achievement tests in Grade 3 Science, Grade 6 Mathematics, and Grade 9 Social Studies changed since 1983 and 1987?

Two studies were carried out. The first study was designed to compare achievement since 1983 on the multiple-choice questions in Grade 3 Science, Grade 6 Mathematics, and Grade 9 Social Studies. The second study was designed to compare achievement since 1987 on the written-response part of the Grade 9 Social Studies test. The results of these special studies follow.

ACHIEVEMENT OVER TIME: MULTIPLE CHOICE

STUDY DESIGN

In the past, achievement-over-time studies carried out by the Student Evaluation Branch involved the re-administration of earlier tests to a sample of students who were also writing the current tests. Because these students had to write two tests, the re-administration was either one week before or one week after the current test administration. However, motivational levels and state of preparation were likely different from when the tests were written during the original administrations. As well, the additional testing time required of students participating in the study was a concern.

To address these issues, a new design was implemented for the 1991 achievement-over-time study. Random samples of students wrote all or part of previous achievement tests under the same conditions as the earlier test administrations. That is, the achievement-over-time tests were administered to the random samples at the same time students in the rest of the province were writing the current achievement test. To maintain the validity of the tests for the 1991 students, the achievement-over-time tests were developed to match the blueprints of the 1991 tests by selecting questions from the previous tests that were still appropriate in 1991. Questions that were no longer appropriate, because of curricular changes, were replaced with 1991 questions. As a result, it was possible to use the 1983 and 1987 Grade 3 Science tests in their entirety, but only parts of the Grade 6 Mathematics and Grade 9 Social Studies tests were still appropriate. As well, a subset of students who were randomly selected to participate in the achievement-over-time study wrote the current 1991 tests so that we could verify that the samples in the study were representative of the province.

Table 8-1 shows the composition of the achievement-over-time (*AOT*) tests in terms of the number of questions they contain from the 1983, 1987, and 1991 tests.

Table 8-1
Comparison of the Achievement-Over-Time Tests by the Number of Questions from the Previous and Current Tests

	1983 *AOT Test*	1987 *AOT Test*	1991 *AOT Test*
Grade 3 Science			
Number of 1983 Questions	50	0	0
Number of 1987 Questions	0	50	0
Number of 1991 Questions	0	0	50
Grade 6 Mathematics			
Number of 1983 Questions	32	0	0
Number of 1987 Questions	0	40	0
Number of 1991 Questions	23	15	55
Grade 9 Social Studies			
Number of 1983 Questions	22	0	0
Number of 1987 Questions	0	20	0
Number of 1991 Questions	38	39*	60

*One question on the Grade 9 Social Studies 1987 AOT test was dropped because of a typographical error.

METHODOLOGY

Sampling of the schools involved in the study was carried out independently in grades 3, 6, and 9. Because of project design considerations, only schools with 24 or more students in regular English programs* who wrote achievement tests in 1990 in the grade being sampled were included in the groups from which samples were drawn. At each of the three grade levels, all eligible schools were identified and listed. From each of these lists, random samples of schools were selected. The sample sizes were targeted for approximately 3 000 students at each grade level. Since the sampling was carried out independently at each grade level, some schools were randomly selected to participate at more than one grade.

Before test materials were shipped, the participating schools submitted to the Student Evaluation Branch copies of their class lists. Within each class, students were randomly assigned to write either the *AOT 1983* test, the *AOT 1987* test, or the *AOT 1991* test. Along with test materials, the class lists were sent back to the schools with instructions about which test each student was to write.

The students who wrote the 1983 achievement-over-time test are referred to hereafter as the *AOT83* group, the students who wrote the 1987 achievement-over-time test are referred to as the *AOT87* group, and the students who wrote the 1991 test are called the *AOT91* group to differentiate them from the students in the rest of the province who wrote the 1991 regular achievement test.

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*See the first footnote on page 9.

Before comparisons were made between the *AOT83* group and the students writing in 1983, and the *AOT87* group and the students writing in 1987, it was necessary to verify that the students selected to participate in the special study were representative of students throughout the province. Since approximately one-third of the students sampled were assigned to the *AOT91* group, it was possible to compare their results with the provincial results. Because the large sample sizes allowed us to detect very small differences, only differences where the probability was less than 0.01 were considered to be significant. Table 8-2 presents the findings.

Table 8-2
Comparison of Results for the *AOT91* Groups with Provincial Results

	AOT91 Results	Provincial Results
Grade 3 Science		
Raw Score Mean	33.8	34.4
Standard Deviation	9.1	8.9
Number of Students	1 169	29 610
Grade 6 Mathematics		
Raw Score Mean	37.1	37.9
Standard Deviation	10.4	10.4
Number of Students	1 119	26 107
Grade 9 Social Studies		
Raw Score Mean	37.7	37.6
Standard Deviation	11.0	10.3
Number of Students	989	21 971

Table 8-2 shows that at all three grades, the means of the *AOT91* group and of the province were within one raw score point. None of these differences was statistically significant at the 0.01 level. As there were no significant differences between the means of the *AOT91* groups and the provincial means, we concluded that the samples of students in the special study were representative of all regular students in the province.

Because Grade 6 Mathematics and Grade 9 Social Studies students in the special study responded to a number of 1991 questions, it was possible to carry out an additional check that the random assignment resulted in groups that were representative of the province. Table 8-3 presents the results of these comparisons.

Table 8-3
Comparison of *AOT* Samples with Provincial Results

	AOT83 Group	Province	*AOT87* Group	Province
Grade 6 Mathematics				
No. of 1991 Questions	23	23	15	15
Raw Score Mean	14.9	15.0	9.6	9.4
Standard Deviation	4.8	4.7	3.3	3.3
Number of Students	1 083	26 107	1 079	26 107
Grade 9 Social Studies				
No. of 1991 Questions	38	38	39	39
Raw Score Mean	23.8	23.9	24.0	24.1
Standard Deviation	6.8	6.6	7.4	7.1
Number of Students	964	21 971	973	21 971

On the 1991 questions, the differences between the means of the students in the special study and the means of students in the rest of the province are within 0.2 raw score points, as can be seen from Table 8-3. These differences are not statistically significant at the 0.01 level. Based on these analyses, we concluded that the random assignment was successful and that the samples are representative of the province.

Since it was established that our samples were representative of the province, we were able to proceed with the comparisons between the 1991 students in the study and the students in 1983 and 1987. As stated earlier, in the methodology section, we restricted our sampling to schools with an estimated minimum size of 24 students in the grade being sampled. When making comparisons with the previous years, we attempted to exclude students who wrote in the earlier years who were from schools that were smaller than the smallest school size in the 1991 samples. However, individual student data were not available for the 1983 Grade 3 Science and Grade 6 Mathematics tests. It was not possible, therefore, to exclude from these comparisons students from schools smaller than the school sizes in the 1991 sample.

In the comparisons, data from all 1983 Grade 3 Science and Grade 6 Mathematics tests were used.

Table 8-4 shows, for each grade, the number of common questions that were answered by both the 1991 students and the students in the previous years, the means and standard deviations for these questions, and the number of students on which these statistics were based.

Table 8-4
Achievement Over Time
Comparison of Descriptive Statistics

	AOT83 Group (wrote in 1991)	Regular 1983 Students	*AOT87* Group (wrote in 1991)	Regular 1987 Students
Grade 3 Science				
Number of Questions	50	50	50	50
Raw Score Mean	42.7*	39.2	39.7*	35.7
Standard Deviation	5.4	N/A **	8.5	7.9
Number of Students	1 119	23 902	1 122	31 087
Grade 6 Mathematics				
Number of Questions	32	32	40	40
Raw Score Mean	21.6*	19.3	29.9*	28.6
Standard Deviation	6.4	N/A **	6.9	6.8
Number of Students	1 083	25 621	1 079	28 573
Grade 9 Social Studies				
Number of Questions	22	22	20	20
Raw Score Mean	14.3*	13.8	13.3	13.4
Standard Deviation	4.2	4.2	4.1	3.9
Number of Students	964	19 299	973	24 671

*The mean for the 1991 students in the *AOT* group is significantly different from the mean of the previous administration at the 0.001 level.

**The original student response data for 1983 were not available. Question difficulties were used to reconstruct the means, but standard deviations could not be reconstructed.

Table 8-4 shows that for all but one comparison of interest, the 1991 students scored significantly higher than the students in 1983 and 1987. The exception is Grade 9 Social Studies, where the achievement in 1991 is the same as the achievement in 1987. Specifically, Grade 3 Science students in 1991 achieved between 3.1 and 3.9 raw score points higher than the 1983 population based upon a 99% confidence interval. This means that the chances are 99 in 100 that the difference between all 1991 students in regular English Grade 3 Science programs and the 1983 students falls within the range specified. Similarily, Grade 3 Science students in 1991 achieved between 3.3 and 4.6 raw score points higher than the 1987 population. Grade 6 Mathematics students achieved between 1.8 and 2.8 raw score points higher in 1991 than the 1983 population, and between 0.8 and 1.8 raw score points higher in 1991 than the 1987 population. Grade 9 Social Studies students achieved between 0.2 and 0.9 raw score points higher in 1991 than the 1983 population, but their achievement was not significantly different from the 1987 population.

More detailed analyses of the changes in achievement are described below for each grade.

GRADE 3 SCIENCE

A comparison of the results of the 1983 test written in 1983 and again in 1991 indicates that more students in 1991 answered questions correctly than students did in 1983. Although higher percentages of students achieved greater success in both process skills and subject matter, the strength of the 1991 Grade 3 Science students was unquestionably in the area of process skills.

In 1991, the increase in the percentage of students correctly answering 1983 process skills questions was dramatic:

- Approximately 30% more students could accurately collect data using their observation skills. They also knew the difference between observations and inferences.
- Approximately 15% more students could successfully group unfamiliar objects according to physical characteristics, using their knowledge and understanding of classification.
- Approximately 10% more students could recognize correct graphical representations of data and infer correct interpretations from the graphed data.
- Approximately 13% more students knew how to measure the length and volume of objects accurately.

Students in 1991 also showed marked improvement over 1983 students in their knowledge and understanding of science concepts:

- Approximately 25% more students understood the capacity of objects made of different materials to float or sink in water.
- Approximately 18% more students understood that some reactions can be reversed and others cannot.
- Approximately 26% more students knew the difference between materials that naturally decompose and those that do not.

A comparison of the results of the 1987 test written in 1987 and again in 1991 indicates that student achievement has improved. An examination of the question-by-question results revealed that although achievement remained the same on some questions, on others a much larger percentage of 1991 students answered correctly compared with 1987 students. Students' ability in the area of process skills has improved since 1987:

- Approximately 15% more students could use their senses to accurately collect data based on observation.
- Approximately 10% more students could measure volume accurately, rank objects based on comparative measurements of mass, and read temperatures on a thermometer.
- Approximately 10% more students had the ability to make interpretations from graphs and infer beyond the data provided.
- Approximately 15% more students could classify objects into groups based on physical characteristics.

Although the greatest improvement was in the area of process skills, students also improved in the area of subject matter. Approximately 10% more students had an understanding of:

- the differences between living and nonliving things.
- shadows and how they are affected by the apparent shift of the sun's position relative to the Earth's rotation.
- how to save energy in the home.
- what the process of dissolving means.

One possible reason for the dramatic improvement in achievement compared with 1983 and 1987 is that teachers are doing a better job of delivering science programs across Alberta, particularly in the teaching of process skills. Another reason is that teachers and students have greater access to resources and support that are imperative for an effective science program. Still another reason is the current overlap of process skills in science with other subject areas, such as social studies and mathematics. This could account for the greater increase in process skills compared with subject matter.

GRADE 6 MATHEMATICS

A greater increase in student achievement occurred from 1983 to 1991 than from 1987 to 1991 in Grade 6 Mathematics. Specifically, increases over 1983 were evident in the following strands and objectives:

- Numeration—understanding of numbers, fractions, and percentages.
- Measurement—recognition of time on the 24-hour clock, knowledge of metric lengths, and application of perimeter and area.
- Geometry—knowledge of terminology and recognition of a segment and a slide.
- Graphing—application of knowledge to solve questions using a bar graph.

By strand, most increases in achievement were in Numeration and Measurement. No important changes were found among questions measuring the strands Operations and Properties, and Problem Solving.

Under the cognitive level taxonomy, there was an overall increase betweeen 1983 and 1991. Large increases were noted on single questions in the areas of Comprehension and Problem Solving, and large increases were noted on several questions in the areas of Knowledge and Application.

Interestingly, there was no achievement increase in routine procedural questions. Questions requiring quick routine calculations were answered correctly by roughly the same or a slightly smaller proportion of students in 1991 as in 1983. This was evident in the non-calculator section.

Increases in achievement since 1987 were generally not large. Large increases were evident in only three questions from the following strands:

- Measurement—approximately 10% more students were able to solve a problem related to finding the volume of a box.
- Graphing—approximately 10% more students were able to recognize similar shapes in a slide image.
- Problem Solving—approximately 15% more students were able to solve a problem related to the understanding of number patterns.

Similarly, the achievement increase from 1987 to 1991 with regard to cognitive levels was small but general. The three questions referred to above were in the areas of Knowledge (1) and Problem Solving (2).

In summary, for Grade 6 Mathematics, our analysis seems to indicate that there was a general but small improvement in all strands, with the least improvement in the area of Operations and Properties. More emphasis seems to have been placed by teachers and administrators on understanding and the application of skills and knowledge, and less emphasis on routine operations without applications. Some causes for the greater increase over 1983 than over 1987 may be that the current curriculum was introduced shortly before the 1983 test, whereas it had been in operation for five years by the time of the 1987 tests. Teachers and education leaders, and therefore students, were increasingly aware of what was expected.

It is interesting that in the basic facts portion of the test, there was a noticeably consistent, albeit small, decline from 1987 to 1991 (1983 is not comparable). In addition, subtraction, multiplication, division, and mixed operations, the average number of questions attempted and the average number answered correctly declined slightly in 1991. We note that the questions were not identical for 1987 and 1991 but were of similar type and expected difficulty. The results may be related to the reduced emphasis on routine operations without applications.

GRADE 9 SOCIAL STUDIES

A slight overall increase in student achievement was found from 1983 to 1991. An examination of the responses to the individual 1983 questions revealed that only three questions showed large increases (10% or greater) in the percentage of students answering correctly compared with 1983. These three questions were based on the knowledge objectives.

The reason for the achievement increase in two of the questions could be that students in 1991 have a stronger vocabulary than students did in 1983. The key words in these questions were "scarcity" and "bias," and students needed to know the meaning of these terms to answer the questions correctly. The other question that showed improvement dealt with the Soviet Union. The achievement increase might, in part, have resulted from the intense media coverage of the events of the past year in the Soviet Union. Interestingly, one question showed a decrease in achievement of approximately 14% between 1983 and 1991. Two of the response options to this question contained the word "materialism." It is possible that with the shift in the focus of the curriculum from "materialism" to "quality of life," 1991 students found this question to be more difficult because they were not familiar with the word.

No large differences in student responses were found between 1987 and 1991.

CONCLUSIONS

Ideally, when comparing achievement over time the same test is given over different time periods to samples of students who have not gained access to the test ahead of time. Since achievement tests are released after administration, it is not possible to guarantee that students writing in subsequent administrations have not seen the test. When developing the new study design, consideration was given to asking teachers whose students were participating in the study not to familiarize students with the previous achievement tests. However, we decided that would not be fair to the students involved, as it can be useful for students to know the types of questions they will be asked to answer. We realized at the time that this was a limitation with the design.

A telephone survey of a sample of teachers whose classes participated in the study revealed that the overwhelming majority of teachers did not have the 1983 tests to practice with because the tests did not remain in schools after the 1983 administration. The few teachers who stated that they did have a copy of the 1983 test indicated that the 1983 test was not given much attention. However, almost one-half of the teachers surveyed indicated that they had gone through all or part of the 1987 test with their students to provide them with an understanding of the format of the test. Very few teachers indicated that they used the 1987 achievement test as a practice test. Since for the grade 6 and 9 achievement-over-time tests selected items from the previous tests were embedded with 1991 items, any effect of practice should have been minimized. Regardless, the 1987 comparisons, especially for Grade 3 Science, should be interpreted with caution. We are confident that the 1983 comparisons are valid.

ACHIEVEMENT OVER TIME: WRITTEN RESPONSE

STUDY DESIGN

Students' writing performance has been of particular interest to educators and to the public since the beginning of the Achievement Testing Program. As a consequence of interest in how well students write, a study was initiated to compare 1987 writing with 1991 writing in Grade 9 Social Studies. This was a qualitative or descriptive study that required the teacher-readers to take a research or "reader-as-observer" stance toward the papers they read, rather than the usual evaluative or "reader-as-assessor" stance of the teacher-marker. No attempt was made to rescore papers; rather, teacher-readers described features of 1987 and 1991 writing in two general categories:

Defence of Position
  —development of ideas
  —persuasiveness
  —accuracy of content

Use of Language
  —vocabulary choices
  —control of conventions: spelling, punctuation, grammar
  —organization and structure

In 1987, the written-response assignment involved short answers and one extended response. In 1991, the assignment was limited to one extended response. In order to facilitate comparison of similar assignments, only the extended response from 1987 was compared with the 1991 assignment.

Comparisons were made at two standards: *Acceptable (3)*, which represents work at an acceptable level for students completing Grade 9, and *Excellent (5)*, which represents outstanding work for students completing Grade 9.

METHODOLOGY

Papers read in the study were selected at random from June 1987 papers that received scores of *Acceptable (3)* or *Excellent (5)* and from June 1991 papers that received scores of *Acceptable (3)* or *Excellent (5)*.

A group of ten experienced teacher-readers, representing all major regions of the province and a variety of school settings, reviewed the selected papers.

Working alone and in pairs, and then discussing papers as a group, the teacher-readers described the papers for features of *defence of position* and *use of language*.

The teacher-readers then compared their descriptions of 1991 and 1987 *Acceptable (3)* and *Excellent (5)* papers and drew conclusions.

RESULTS

The results of the study are given in tables 8-5 and 8-6. Each comment describes the features of what students writing at a particular level did in 1991 compared with students in 1987. The wording in the tables comes directly from teacher-reader's descriptions.

The level of expectations embedded in the 1991 scoring criteria was increased significantly from the 1987 criteria. However, the work described at each level met the standard established for the appropriate marking session. Teacher-readers agreed that papers judged to be *Acceptable (3)* were considerably better in 1991 than in 1987. As well, a higher percentage of students were able to achieve the *Acceptable (3)* level in 1991 than in 1987. Improvements were noted as well in the papers scored *Excellent (5)*; however, fewer students achieved this level in 1991 than in 1987.

Table 8-5
Acceptable (3) Papers in Social Studies 9

KEY FEATURES OF 1991 ACCEPTABLE (3) PAPERS	KEY FEATURES OF 1987 ACCEPTABLE (3) PAPERS
Defence of Position	**Defence of Position**
• could identify with issue on a personal level, focused	• did not relate to topic, sense of remoteness from topic
• genuine concern, commitment toward topic	• lack of understanding of issue
• use of own experiences to support statements	• limited defence of position, support was superficial
• use of prior/media/other subject knowledge common	• did not incorporate information from outside social studies classroom
• tendency to "broaden" topic to include other environmental concerns	• identified with one of the speakers, not with a position
• insight shown but not consistent	• lacking in insight
• sense of urgency regarding topic	• emotionalism rather than conviction
• simplification of concepts common	• basic social studies concepts generally understood but in a concrete manner only
• ideas generally organized	• ideas poorly organized
• confusion over government levels and roles	Note: the question did not require students to address levels and roles of government
Use of Language	**Use of Language**
• paragraphing skills evident	• poor organization and structure
• specific words, dynamic vocabulary attempted	• limited vocabulary
• general attempt to use and spell social studies terms correctly	• frequent errors in spelling, punctuation, and grammar
• environmental "buzz words" and jargon common	• "Motherhood" statements common

Table 8-6
Excellent (5) Papers in Social Studies 9

KEY FEATURES OF 1991 EXCELLENT (5) PAPERS	KEY FEATURES OF 1987 EXCELLENT (5) PAPERS
Defence of Position	**Defence of Position**
• encouraged personal involvement/identified with topic	• attitude of detachment from topic
• insightful, creative thought exhibited	• little personal insight
• focused, controlled, does not wander	• no creativity in approach to topic or possible solutions
• social studies concepts incorporated	• limited inclusion of social studies concepts
• convincing, persuasive arguments	• mechanical argumentation
• qualitative evaluation, used data well	• position supported with multiple arguments
• more than one idea presented	• examples very specific
• clear delineation between roles of government/business/public	• good use of data from outside social studies classroom
• genuine concern with topic, healthy skepticism exhibited	• both sides of question understood
• occasional meaningless regurgitation of statistics to support argument	• acknowledgment of flaws in argument or of the opposite view, and rebuttal
• understood government levels, roles, limitations • good understanding of economic systems	Note: the question did not require students to address government levels, roles, limitations nor did it make reference to economic systems
Use of Language	**Use of Language**
• experimental use of vocabulary	• advanced technical vocabulary
• sense of audience, with careful attention to spelling and conventions	• good spelling and grammar
• variety in forms of expression	• logical organization and good structure
• dramatic language used but generally well controlled	• accurate but pedantic language used

The question that guided the study—**Has writing by Grade 9 Social Studies students improved from 1987 to 1991?**—was answered in the affirmative. The 1991 students at the *Acceptable (3)* level of performance produced better writing than did their 1987 counterparts. Although a lower percentage of students were able to achieve the *Excellent (5)* level of performance in 1991, those who did so produced better writing.

A change in the scoring criteria between 1987 and 1991 reflected an increase in standards and in the level of expectations for Grade 9 Social Studies students. This may have contributed to the lower percentage of students able to achieve a score of *Excellent (5)*. However, even with this increase in standards and criteria, a significantly greater number of students were able to achieve a score of *Acceptable (3)*. One possible conclusion is that while top-range students' writing has not changed markedly since 1987, average-range students' writing is better.

A greater variety of response formats may also have contributed to the improved writing on the 1991 test. Students in 1991 could choose to write a letter, speech, editorial, or position paper, whereas 1987 students were limited to a prescribed letter format.

In 1991, students addressed only one written response, whereas in 1987 students answered four short written-response questions before attempting the extended response. This may have contributed to the higher number of INS (insufficient) responses in 1987. Within the confines of a test situation, some students may have experienced oversaturation with the topic before attempting the extended response.

Teachers participating in the study theorized that the greatest factor in improved writing was related to the topic itself. The teachers felt that the 1987 topic—To What Extent Should the Natural Resources of the Eastern Slopes be Developed?—had little sense of immediacy or relevancy for many students. The commitment to a topic that lends itself to more involved argumentation and more persuasive writing was missing.

In contrast, familiarity with the 1991 topic—How Should the Government of Alberta be Involved in Recycling Programs?—allowed students to tie their experiences and convictions to the writing assignment. Such a personal connection to the issue may partially account for the greater percentage of students able to achieve an *Acceptable (3)* score. That this broader 1991 topic was also a more accessible topic is evidenced by the greater percentage of students responding to it. In 1987, 3.8% of students produced INS papers, whereas in 1991 only 1% did: almost all 1991 students felt competent to address this topic.

A remarkably high percentage of students achieved an *Acceptable (3)* or higher score for Use of Language on the 1991 test. Teachers concluded that this might be attributed to two factors:

- a greater emphasis on student writing in all subjects and at all grades levels
- social studies classroom instruction and practice in effectively communicating ideas central to the development of issues

Given that assignments have become cognitively more challenging, yet much more open-ended, and that standards have become more demanding and still students' work has improved, one might conclude that classroom instruction that fosters critical thinking and clear, concrete expression of ideas has been the greatest factor in improving student writing.

Detailed discussion of the study design, methodology, results, and conclusions can be obtained by calling the Achievement Testing Unit of Student Evaluation Branch, Alberta Education, at 427-0010.

SECTION 9
DIRECTIONS: BROADENED ASSESSMENT

PURPOSE

Broadened assessment is a strategy that includes the use of different evaluation methods and instruments designed to collect a broader range of information about what students know and can do. Along with paper and pencil tests, broadened assessment will assist us in creating a more complete picture of what students learn and how they apply those learnings. This strategy is designed to assess students in a manner that reflects the way students learn and to support effective classroom teaching.

During the 1990–91 school year, the Achievement Testing Unit of the Student Evaluation Branch initiated the development of many broadened assessment strategies. With the assistance of classroom teachers, the assessment instruments were validated for field testing purposes in the spring of 1991. The number of students who participated in each field test ranged from 150 to 1 350. A brief description of each instrument and some general findings based on student results follows.

GRADE 3: ACROSS-CURRICULUM PORTFOLIO ASSESSMENT

The portfolio project was designed to answer the question, **At what level are Grade 3 students performing in oral communication, problem-solving, participation, and process skills?**

ORAL COMMUNICATION SKILLS

This component involved the audio taping and/or video taping of an oral presentation by Grade 3 students in classrooms across Alberta. Students could make their presentation individually or in small groups to the students in their classrooms. Presentations could range from puppetry or storytelling to interviewing or reporting but did not have to be language arts material specifically.

Through an analysis of the audio and video tapes, we learned that students working ***at level*** show a move toward independence; however, occasional prompting and/or support is needed. These students have a beginning awareness of audience, purpose, the need to project their voices, and the importance of voice, face, and body language. The tasks they undertake are basic. Their props, when used, are simple, and they may have some difficulty using them. They are starting to show more confidence in their ability; hence, they are only somewhat nervous in front of an audience.

Students working ***beyond level*** demonstrate self-control and can work independently. These students need minimal support and are willing to take risks. They display confidence in their ability and have developed awareness of audience, purpose, and logical sequence. They recognize the importance of voice, face, and body language.

Students ***not yet at level*** exhibited few of the characteristics of the students ***at level***. They were reluctant participants, usually very nervous and intimidated by an audience.

The teachers involved in this evaluation thought that the assessment of oral communication skills in language learning has, for the most part, been neglected. They also thought that the basic premise of the study was a good one and suggested several modifications that, when incorporated, should result in an assessment instrument of improved quality.

PROBLEM-SOLVING SKILLS

This component was designed to gather information about Grade 3 students' problem-solving skills and strategies. Teachers were asked to select, with their students, a problem-solving activity and use Polya's problem-solving model. The activity required the students to use insight, lent itself to a variety of solutions, and involved a mathematical process or skill.

Teachers developed a holistic scoring guide to evaluate students' work.

We learned that most students performing ***at level*** could:

- identify the question being asked
- identify relevant and key words
- develop a plan to find an answer
- use the plan to find an answer

Students performing ***beyond level*** could do all of the above as well as:

- restate the problem in their own words
- write a number sentence to match the problem
- recognize that there is more than one way to solve a problem
- identify and solve multiple-step problems

Students ***not yet at level*** required constant prompting and support to engage in and complete the tasks.

PARTICIPATION SKILLS

Classroom teachers assessed their students' participation skills through the use of the skill development charts found in the Social Studies *Program of Studies*. Teachers agreed that the checklist approach would be the most effective and manageable way to collect the information.

After the checklists were reviewed and the information was compiled, teachers agreed that students participating ***at level***:

- understand the need for rules and/or for observing them
- often show respect for the rights and opinions of others
- may be easily distracted but attention can be focused back
- understand the difference between a leader and a follower

Students participating ***beyond level*** had all of the above characteristics and:

- are actively involved in making group rules
- always show respect for the rights and opinions of others
- stay focused despite distractions from others
- accept a leadership role as necessary

Those students ***not yet at level***:

- generally believe that rules are for others
- are unable to stay on task
- find it difficult to take turns and participate cooperatively
- have difficulty understanding the difference between leader and follower

Teachers strongly support this method of assessing student participation skills because it supports the teaching and assessment of an important part of the curriculum that has been neglected. Teachers also suggested minor revisions to the checklist and the level descriptors in an effort to improve the quality and reliability in the information that this instrument gathers.

PROCESS SKILLS

This study required students to use materials provided in a baggie to complete seven tasks that were designed to assess their ability to perform process skills outlined in Division I Science. Analytic scoring criteria were developed, validated, and applied by teachers. Results indicate that students performing ***at level*** could:

- measure using arbitrary units and measure accurately
- select appropriate devices for collecting data
- predict from graphed data
- classify natural objects according to only one property

Student performing ***beyond level*** could also:

- organize data in a graph
- rank objects from heaviest to lightest
- classify natural objects using more than one property
- provide written descriptions of methods of classification

Students that were ***not yet at level*** could:

- rank most objects from heaviest to lightest
- classify some natural objects using only one property

Teachers felt that this method of assessment was extremely useful and informative in that it:

- supported classroom teaching
- provided a meaningful context for learning and assessment
- provided results that could be used to improve instruction

In addition, they said that students didn't feel as though they were being tested. Instead, students commented that they were learning something as they progressed through each activity.

GRADE 3: ACROSS-CURRICULUM THEMATIC TEST

This field test focused on a theme integrating Grade 3 science, mathematics, social studies and language arts. New questions reflecting a context that students can easily relate to were included. The theme was chosen to reflect the way many students learn and teachers teach in the classroom. An eight-and-one-half-inch by fourteen-inch information sheet about the seasons provided context for the test and information for the student that could be used to answer each question.

The questions were of different designs, ranging from shading in graphs to indicate the number of visitors to the park in winter to shading in the number of coins that would buy a toy boat worth 90 cents. For the writing assignment, students were able to make a choice. They could either write a report, using the facts provided, about the beaver and why beavers were good swimmers, or write a story about their favorite season, telling why it is their favorite.

The following are comments made by Grade 3 teachers:

> "Reflects integration of subject areas—theme-based just like lessons."
>
> "I think this is a great idea—it really fits in with the way primary education is done—thematically!"
>
> "This test is fun and interesting to do. I think children would enjoy this test and would find it challenging."

Only one teacher believed that this type of test was inappropriate. Students who wrote the test commented that it was interesting, hard, and made them think. Field testing this instrument resulted in valuable input from teachers and students that, when incorporated into the test, will provide an assessment instrument of better quality.

GRADE 6: MATHEMATICS AND SCIENCE PERFORMANCE-BASED ASSESSMENT

This assessment was designed to answer the question, **Can performance assessment broaden the description of what students know and can do in the application of their problem-solving and/or science process skills?** Performance-based assessment engages students in the use of "hands-on" materials to complete meaningful real-life activities. Although there was no time limit, students were encouraged to complete each activity within 10 to 15 minutes.

Scoring criteria were used to describe what students demonstrated they knew and could do. Most students were able to:

- infer possible effects of change within an ecosystem.
- infer the path that electricity travels in hidden circuits
- construct simple electrical circuits using a bulb, wire, and a dry cell
- classify animals as predator or prey on the basis of their special adaptations
- make predictions and inferences based on direct observation and recorded data
- locate the outline of a two-dimensional picture using ordered pairs
- use manipulatives to determine the shortest route between two points on a map
- rank objects from heaviest to lightest using an equal-arm balance
- convert tally information to equivalent fractions and decimals
- construct bar graphs to accurately reflect data collected
- create classifications for data collected
- find and compare volume of rectangular prisms

Classroom teachers felt that this type of assessment provides accurate information about what students can actually do and how well they can do it.

The following are comments made by students:

> "It was easy, big, and interesting."
>
> "I thought that this was great, especially the science part where you had to join wires and make light bulbs work."
>
> "In math I liked the K that you had to flip, slide, and turn."
>
> "It's a lot better than multiple-choice tests because you have things to work with instead of a paper and pencil."

After the teacher validation comments are reviewed further, some activities may have to be revised and perhaps new ones developed for field testing in spring 1992.

GRADE 6: VIEWING AND LISTENING SKILLS ASSESSMENT

This assessment was designed to answer the question, **At what level are students in Grade 6 performing in listening and viewing skills?**

LISTENING SKILLS

The listening skills component required students to listen to three pieces of literature. After hearing the fiction and nonfiction selections, students answered some multiple-choice questions. After hearing the poetry piece, they retold what they heard. In addition, students listened to some directions and did what the directions asked them to do.

The information collected was analysed by Grade 6 teachers. They also used information provided by teachers who field tested the instrument to describe student expectations for "at level" and "not yet at level" performances.

Students who are ***at level*** are able to retell a great many of the significant details and events. Most of the time, the sequencing of the events and/or details is correct. These students understand the denotative meanings of words they have heard; however, they may experience more difficulty with the connotative meaning of words. ***At level*** students can paraphrase a spoken message but will experience some difficulty doing so. They can also follow oral directions but will make a few errors in the process. The ***at level*** students generally lack some of the confidence in their general listening skills typically found in the beyond level students. As a result, their critical listening skills are not quite so well developed.

Students who are ***beyond level*** are consistently able to retell all significant details and events in proper order. These students understand both denotative and connotative meanings of words that they have heard. ***Beyond level*** students can paraphrase a spoken message with no difficulty and follow oral directions with no errors. In addition, they display confidence and competence in their general listening skills. As a result, they are excellent critical listeners as well.

Students who are ***not yet at level*** are usually able to retell only a few of the significant details and events. Students functioning at this level have a confused idea of sequence. These students typically have a difficult time understanding all but the most basic vocabulary. Connotative meanings are not understood at all. Paraphrasing for these students is difficult because they probably had considerable difficulty understanding what they heard.

VIEWING SKILLS

For the viewing skills component of the assessment, students were given two pictures. They had to describe what they saw in each picture and then compare and contrast how they felt when they looked at both pictures. In addition, they had to look at a political cartoon and explain what message they got from it.

The information collected was analysed by Grade 6 teachers. From the analysis, teachers were able to describe student performances that reflect curriculum expectations for ***at level, beyond level,*** and ***not yet at level*** performances.

Those students who are functioning ***at level*** are able to communicate in writing information they derive from a visual presentation; however, their statements tend to be general. The general knowledge base of these students is not as broad as those performing beyond level. When asked to describe a picture, these students are able to pick out general details, but the subtleties will escape their detection. When students performing ***at level*** examine pictures that display different emotions, they have some difficulty interpreting the various moods and feelings portrayed. The ***at level*** students can compare and contrast different pictures only if the pictures are relatively straightforward and not too detailed.

Students who are functioning ***beyond level*** are able to communicate in writing information they derive from a visual presentation. The information is generally quite sophisticated because these student bring a broad general knowledge base to their understanding. When asked to describe a picture, students performing ***beyond level*** are able to pick out the most minute details. They are also able to examine pictures displaying different emotions and interpret the various moods and feelings portrayed. These ***beyond level*** students show an ability to compare and contrast different pictures, and provide many appropriate details.

Students ***not yet at level*** demonstrate a limited understanding of what they view. Thus, they are able to communicate in writing in only a superficial manner. When asked to describe a picture, these students pick out only the most obvious features of the picture. Students ***not yet at level*** have a great deal of difficulty interpreting moods and feelings portrayed in pictures displaying various emotions. These students are not able to compare and contrast different pictures unless the pictures are very basic.

This type of assessment was received very positively. In the spring of 1992, student viewing and listening skills will be assessed on a sample basis and reported next year with the Grade 6 English Language Arts Achievement Test results.

GRADE 9: MATHEMATICS AND SCIENCE PERFORMANCE-BASED ASSESSMENT

This assessment was designed to answer the question, **Can performance assessment broaden the description of what students know and can do in the application of their problem-solving and/or science process skills?** Although there was no time limit, students were encouraged to complete each activity within 10 to 15 minutes.

Scoring criteria were used to describe what students knew and could do. Students were able to:

- find the square root of a number using estimation
- understand and use a strategy for finding the surface area of any right prism
- interpret maps and scale drawings
- use ratios to solve problems
- use a dichotomous key to classify animals
- determine experimentally which of two materials is a better insulation, which wall design conserves heat energy best, and which of two liquids is best to use in a cooling system
- construct series and parallel electrical circuits
- determine the effect of temperature on rates of reaction

The performance of many Grade 9 students was disappointing. They experienced difficulty in arriving at solutions that were correct. This may be the result of a weakness in lab skills and/or use of manipulative.

However, Grade 9 students enjoyed the assessment and commented that it was better to have their hands actually on the materials to solve problems or explain concepts rather than imagine everything from a diagram on paper. Teachers saw ways in which these activities could be easily incorporated into classroom instruction. In addition, they saw how important aspects of the curriculum could be emphasized when incorporated into this type of assessment.

GRADE 9: PARTICIPATION SKILLS ASSESSMENT

This assessment was designed to answer the question, **At what level are students in Grade 9 performing in participation skills?** Ten teachers from across Alberta used three different forms or checklists to indicate the intrapersonal skills, interpersonal relations, and group process and discussion skills for each student. Accompanying the forms was a five-point rating scale, where 1 indicated no evidence that the student possessed the skill and 5 represented student independence and control.

The ratings assigned to students by teachers participating in the assessment provided a lot of detail about the participation skills of students in Grade 9. From this information, descriptions of at level, beyond level, and not yet at level performance of students' participation skills have been developed.

Students performing ***at level*** deal well with minor frustrations and seek assistance when needed. These students often make good choices and have the ability to empathize with others. However, students performing ***at level*** tend to feel that they have the best opinion and sometimes are impulsive in responding. These students compromise occasionally and accept disagreement. In groups, they co-operate actively with others and work as directed by the teacher and/or group leader. Occasionally, students performing ***at level*** will monopolize discussions.

Students performing ***beyond level*** deal with personal frustration in a positive manner, seek help on more difficult assignments, and make logical choices. They also have an internal drive to challenge themselves. These students see how behavior affects others. They can be given a task and left to work at it independently. In addition, ***beyond level*** students respond positively to the opinions of others and defend the rights of others. They wait to be recognized before speaking, spend time helping others freely, and seek compromise. Students performing beyond level display leadership skills in group discussions. They are always on task and lead others by example.

Students performing ***not yet at level*** express anger and lack self-control when frustrated. They often refuse assistance and refuse to make decisions. These students criticize external forces and fail to see how their behavior can affect others. In many instances, these students monopolize their teachers' time and require constant instruction.

Students ***not yet at level*** believe there is only one answer, and they will not compromise. They interrupt the class with negative or incorrect responses and attempt to redirect the flow of the class. These students respond negatively toward the mistakes of others and refuse to compromise or co-operate. They often use slang terms to express disagreement.

In addition, students performing ***not yet at level*** seek to distract group members from the task at hand. If they don't frequently and aggressively monopolize discussions, they totally withdraw from discussions.

Participation skills of students are an important part of any program. With the assistance of classroom teachers, descriptions such as those presented here will continue to be revised and refined.

FUTURE DIRECTIONS

Broadened assessment will continue to be the focus for development and study in the future. The commitment of the Achievement Testing Unit is to search for assessment methods that will provide the opportunity for students to demonstrate what they have learned in other areas of the Programs of Study not normally assessed on a paper and pencil test.

In 1992, broadened assessment instruments will be implemented as part of the regular achievement testing program and results will be reported as part of the overall results. Field tests will be administered in other areas as well:

Grade 3
- Participation Skills Assessment
- Science Performance-based Assessment
- Language Learning Performance Assessment

Grade 6
- Listening and Viewing Skills Assessment
- Mathematics Performance-based Assessment
- Science Performance-based Assessment

Grade 9
- Mathematics Performance-based Assessment
- Science Performance-based Assessment
- Participation Skills Assessment

For further information, please contact a member of the Achievement Testing Team:

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APPENDIX A
STANDARDS

The move toward a results-based curriculum has re-emphasized the need for a clear delineation of standards and of their purpose. All standards and all methods of setting standards require judgment.

> The process of setting a standard can be only as good as the judgements that go into it. The standard will depend on whose judgements are involved in the process. In this sense, all standards are subjective. Yet, once a standard has been set, the decisions based on it can be made objectively. Instead of a separate set of judgements for each test-taker, you will have the same set of judgements applied to all test-takers. Standards cannot be objectively determined, but they can be objectively applied.[1]

DEFINITIONS

The Achievement Testing Program is directly concerned with three different but related standards. These standards are provincial curriculum standards, provincial achievement standards, and provincial assessment standards.

- **Curriculum Standards** are the expected student learnings sequenced into levels. They include specific statements of knowledge, skill, and attitude expectations against which student performance is judged. These standards are established in the process of curriculum development and are found in the *Program of Studies* document produced for each course.

- **Achievement Standards** are judgments that specify what percentage of students are expected to achieve an acceptable and an excellent level of performance in relation to each course of studies, i.e., the relevant curriculum standards. It is important to point out that this judgment is not a prediction of the percentage of students who will actually achieve acceptable or excellent levels of performance but rather is a specification of the percentage of students at a given age or grade in school who are expected to perform at an acceptable or excellent level. These standards apply to school, jurisdiction, and provincial achievement.

- **Assessment Standards** are the criteria adopted for judging actual student achievement relative to curriculum standards. They are ultimately expressed and applied as test scores. They are derived from answers to the following or similar questions: **What scores must students obtain or how many questions and/or which specific questions on a given test must students answer correctly in order for their performance on the test to be judged as acceptable (or excellent)?** These standards apply to individual student performance.

Indirectly, the Achievement Testing Program influences *local targets.*

- Local Targets are the objectives set in schools and jurisdictions to assist students in moving toward or exceeding the provincial achievement standards. These local targets reflect the specific needs of individuals and groups within a specific community.

The Student Evaluation Branch is responsible for establishing and reporting the provincial assessment standards and shares responsibility with the Curriculum Branch for establishing provincial achievement standards as they relate to the Achievement Testing Program.

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[1] *Passing Scores;* Samuel A. Livingston, Michael J. Zieky; Educational Testing Service, 1982

PURPOSE

The purpose of defining assessment and achievement standards, and the subsequent process of setting the provincial assessment standard within the sphere of the Achievement Testing Program, is to answer questions such as:

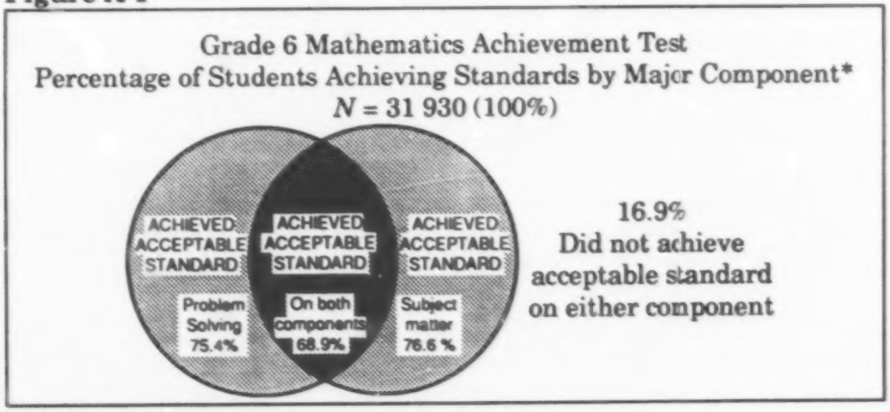
- What is "Acceptable" and "Excellent" performance in relation to the curricular expectations for students at the age or grade being tested?
- What percentages of students at the age or grade being tested ought to achieve an "Acceptable" and "Excellent" level, assuming adequate teaching and resources?
- What scores on a specific test shall reasonably represent "Acceptable" and "Excellent" performance respectively?
- What are the prevailing strengths and weaknesses of Alberta students in relation to the curriculum being tested?
- What questions or tasks, when answered or performed correctly, on a particular test reflect "Acceptable" and "Excellent" performance?

In essence, for each test and level of performance, the assessment standards setters are challenged to answer the question, **What score must a student obtain or how many questions must a student answer correctly to be judged as having achieved an acceptable or excellent standard?** Satisfactory performance may only be said to exist when the percentage of students scoring at or above the assessment standards is equal to or greater than the achievement standards.

COMPONENT STANDARDS VERSUS A TOTAL TEST STANDARD

Each achievement test has traditionally been divided into **two major components**. In mathematics, for example, the components are problem solving and subject matter. In the past, some students were achieving the acceptable standard on the total test while being unable to perform well on one of the two major components. For example, a mathematics student might be able to answer correctly all or most of the subject matter questions but be very weak on the problem-solving questions. Based on a "total test score," this student could have been reported as having achieved the acceptable standard in mathematics, whereas his or her performance on one major component would not have been acceptable. Using the Grade 6 Mathematics results to illustrate, Figure A-1 shows the percentage of students achieving the acceptable assessment standard for each of the two major components. Note that the percentage of students achieving the acceptable standard for both components is less than the percentage achieving the acceptable standard on each of the components. Some students achieved the acceptable standard on only one of the major components. Students, now and in the future, who are judged to have acceptable performance will have met the standard on **both components**.

Figure A-1


Grade 6 Mathematics Achievement Test
Percentage of Students Achieving Standards by Major Component*
N = 31 930 (100%)

ACHIEVED ACCEPTABLE STANDARD
Problem Solving 75.4%
ACHIEVED ACCEPTABLE STANDARD
On both components 68.9%
ACHIEVED ACCEPTABLE STANDARD
Subject matter 76.6 %
16.9%
Did not achieve acceptable standard on either component

*Figure not to scale

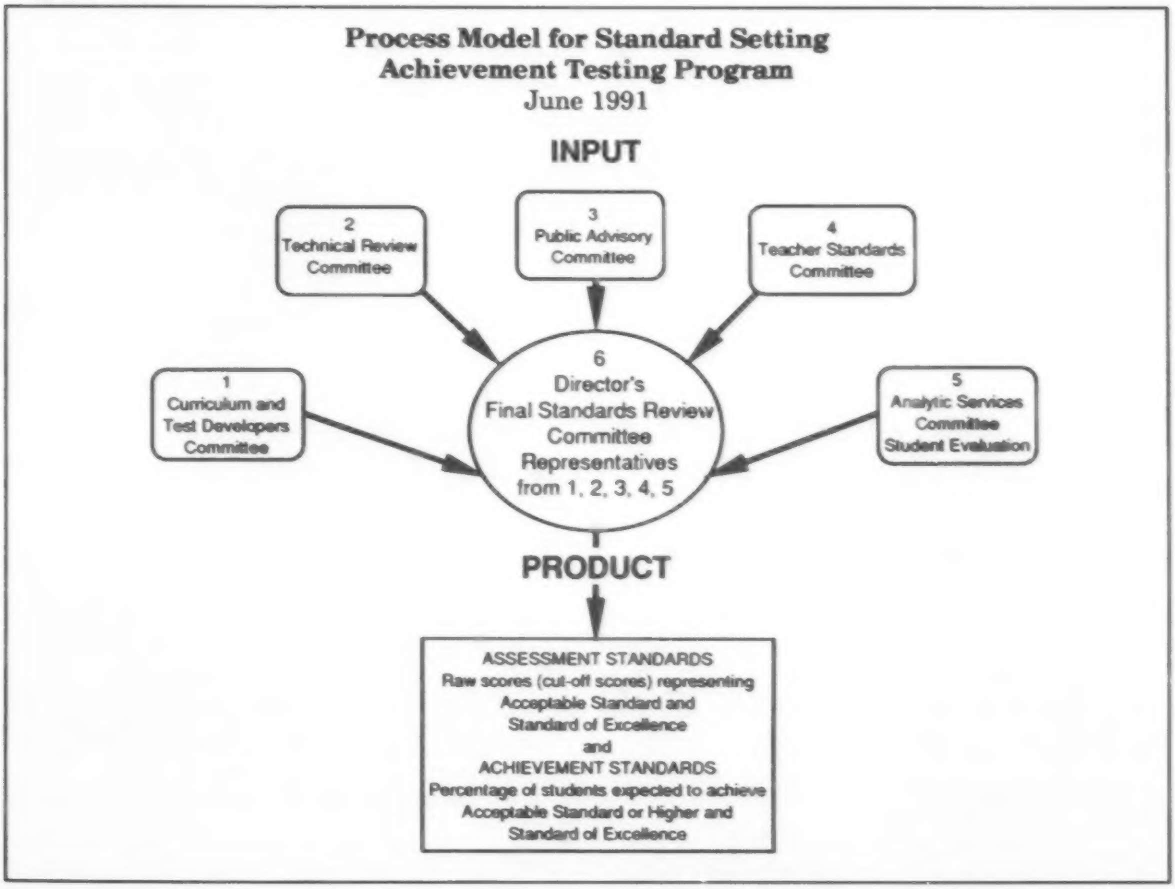
Tables dealing with standards in sections 2, 3, and 4 of this report show what percentage of students achieved standards on each of the major components and what percentage of students achieved standards on both components. For this year only, a total test standard was also determined and reported in order to provide for comparison with previous results.

It should be noted that standards were set only on the English versions of the achievement tests and they apply only to students in regular English programs. The Francophone, French Immersion, and other programs did not have sufficient numbers to set standards in a fair and equitable manner. Students in these programs should not be compared with the standards set for the majority English program population; however, local target standards are recommended for these groups.

THE ASSESSMENT STANDARD-SETTING PROCESS

Figure A-2 shows the model initiated by the Student Evaluation Branch to set standards for the 1991 achievement tests. **The objective was to widen the process of setting assessment standards as much as possible over previous years and especially to provide for community input and feedback.** The process involves individuals and groups in making judgments that contribute to establishing the assessment and achievement standards.

Figure A-2


Process Model for Standard Setting
Achievement Testing Program
June 1991

INPUT
2 Technical Review Committee
3 Public Advisory Committee
4 Teacher Standards Committee
1 Curriculum and Test Developers Committee
6 Director's Final Standards Review Committee Representatives from 1, 2, 3, 4, 5
5 Analytic Services Committee Student Evaluation
PRODUCT
ASSESSMENT STANDARDS
Raw scores (cut-off scores) representing
Acceptable Standard and
Standard of Excellence
and
ACHIEVEMENT STANDARDS
Percentage of students expected to achieve
Acceptable Standard or Higher and
Standard of Excellence

Except for the members of the Public Advisory Committee, the members of all committees outlined in Figure A-2 are expected to be highly knowledgeable about both the curriculum and the learning characteristics of the students who are writing the tests. The committees are briefly described below.

1. Curriculum and Test Developers Committee

There is one Curriculum and Test Developers Committee for each achievement test. The committee consists of Alberta Education consultants, curriculum developers, and test development specialists. Their objective is to recommend assessment standards to the Final Standards Review Committee. They may also review and make recommendations on achievement standards.

2. Technical Review Committee

There is one Technical Review Committee for each achievement test. Experienced and knowledgeable educators—teachers, superintendents, university professors, and Alberta Education consultants—meet with the developers of each test. Their purpose is to review the test and make recommendations for improvements where necessary. Because of time constraints, the Technical Review Committee was not formally involved in the setting of assessment standards for June 1991. However, in future years this committee will set and recommend assessment standards. In addition, it will review the appropriateness of current course achievement standards.

3. Public Advisory Committee

The Public Advisory Committee, composed of representatives from the general public, met and discussed standards for the first time this year. See Appendix B for more information on the proceedings of this committee.

4. Teacher Standards Committee

Approximately 20 experienced teachers from different areas of the province are selected to sit on a Teacher Standards Committee for each test. To be selected for a committee, a teacher must have been teaching in the grade and subject area for the previous two years. At present, the procedures used to aid teachers in setting the assessment standards are the modified Angoff method for Mathematics and Science subjects and the Nedelsky method for Humanities subjects.[2] The teachers make judgments about appropriate assessment standards and make recommendations to the Final Standards Review Committee. As well, they review achievement standards for appropriateness.

5. Analytic Services Committee

The Analytic Services Unit of the Student Evaluation Branch is the professional quality control and advisory group for the complete process of standard setting. There is a committee of professionals in psychometrics and statistics for each test. A critical function is to ensure that Alberta Education's standard-setting procedures produce technically valid results that meet the strict requirements of high quality professional studies. The committee makes recommendations for assessment standard-setting procedures, leads individual group discussions, and recommends improvements where necessary. Another function is to determine, independently, assessment standards through statistical analyses of current student achievement data.[2]

6. Final Standards Review Committee

The Final Standards Review Committee consists of representatives from the above committees and is chaired by the Director of Student Evaluation. In separate sessions, the recommendations of all test committees are presented and, through consensus, final assessment standards are adopted for each test.

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[2] A Consumer's Guide to Setting Performance Standards on Criterion-Referenced Tests, Ronald A. Berk: Review of Educational Research, Spring 1986, Volume 56.

1991 ASSESSMENT AND ACHIEVEMENT STANDARDS

To achieve an acceptable standard, students were required to obtain a certain score or to answer correctly a certain number of questions from any part of the test. To achieve a standard of excellence in previous years, students were only required to answer correctly a certain number of questions from the total test. In 1991, for the first time, students were required to satisfy an additional criterion. To achieve a standard of excellence in grades 3 and 6, students were required to answer correctly a minimum number of questions from the larger group of specific questions that were identified by standard setters as measuring achievement at an excellent level.

Tables A-1, A-2, and A-3 show the assessment and achievement standards adopted in June 1991 by the Final Standards Review Committee for the grades 3, 6, and 9 achievement tests.

Table A-1
Grade 3 Science
Assessment and Achievement Standards
June 1991

	Maximum Possible Raw Score	Provincial Assessment Standard (Raw Score)	Provincial Achievement Standard (Per Cent)
Standard of Excellence			
Process Skills	36	32*	15
Subject Matter	14	12**	15
Both Major Components	36 + 14	32 + 12	10
Acceptable Standard			
Process Skills	36	19	85
Subject Matter	14	8	85
Both Major Components	36 + 14	19 + 8	80

*The 32 correct answers must include at least nine of the 13 questions that measure achievement at an excellent level. The 13 question numbers are 5, 6, 13, 16, 22, 35, 37, 38, 39, 44, 45, 48, and 50. These are 13 of the 36 Process Skills questions identified as questions that would challenge students performing at a level of excellence.

**The 12 correct answers must include both of the questions that measure achievement at an excellent level. The two question numbers are 2 and 17. These are two of the 14 Subject Matter questions identified as questions that would challenge students performing at a level of excellence.

Table A-2
Grade 6 Mathematics
Assessment and Achievement Standards
June 1991

	Maximum Possible Raw Score	Provincial Assessment Standard (Raw Score)	Provincial Achievement Standard (Per Cent)
Standard of Excellence			
Problem Solving	25	21*	15
Subject Matter	30	27	15
Both Major Components	25 + 30	21 + 27	10
Acceptable Standard			
Problem Solving	25	13	85
Subject Matter	30	17	85
Both Major Components	25 + 30	13 + 17	80

*The 21 correct answers must include at least nine of the 11 problem-solving questions that measure achievement at the excellent level. The 11 question numbers are 4, 19, 25, 27, 32, 41, 50, 51, 52, 53, and 54.

Table A-3
Grade 9 Social Studies
Assessment and Achievement Standards
June 1991

	Maximum Possible Raw Score	Provincial Assessment Standard (Raw Score)	Provincial Achievement Standard (Per Cent)
Standard of Excellence			
Facts, Concepts, and Generalizations	33	29	15
Process Skills	67	53	15
Both Major Components	33 + 67	29 + 53	10
Acceptable Standard			
Facts, Concepts, and Generalizations	33	17	85
Process Skills	67	31	85
Both Major Components	33 + 67	17 + 31	80

During 1991, much review and discussion of standards was undertaken before adjusting the process of standard setting to meet the current and impending needs of Alberta Education's Achievement Testing Program. The exercise was enlightening and useful. However, we do not expect that the process will fit the needs of all. We invite your questions, comments, and recommendations. Please send your observations to Michael Robinson, Assistant Director, Analytic Services, Student Evaluation Branch, at 427-2948.

APPENDIX B
PUBLIC REVIEW OF ACHIEVEMENT STANDARDS AND RESULTS

On July 24 and 25, 1991, representatives of nine business, professional, and community organizations reviewed achievement test results and discussed standards. This was the first time such a meeting was held. It was planned to ensure that input from groups representing "public" interests would be considered in the overall reporting of results. The purpose of the meeting was to gather direct public input into the question, **How well should Alberta students achieve in Grade 3 Science, Grade 6 Mathematics, and Grade 9 Social Studies?**

The two-day meeting was designed to collect information that would contribute to a better understanding of how well our students in Alberta are doing. This was accomplished by exploring and discussing answers to four questions. Each question is listed below, along with the results of the meeting.

- **What do members of the public expect students to know and be able to do in Grade 3 Science, Grade 6 Mathematics, and Grade 9 Social Studies?**

Comments: For each subject area, participants listed the knowledge and skills that they felt were important learnings for students to achieve at each grade level.

The following key points highlight the group's views:

Science 3

Students should be able to:
- demonstrate a curiosity toward science
- make decisions and take risks when solving problems
- use science skills in real-life situations
- communicate both orally and in writing

Mathematics 6

Students should be able to:
- know how to solve (at minimum) two-step problems
- perform straightforward numerical operations (addition, subtraction, multiplication, division)
- interpret and use information using various methods (e.g., graphs)
- estimate in different situations
- collect and record data

Social Studies 9

Students should be able to:
- think critically to support decision-making skills (interpret data, make connections, integrate ideas, etc.)
- present both sides of an issue clearly, with supporting information
- understand the structure of Canadian society and related social issues
- use good communication skills (oral and written)
- use good research skills

- **How closely do the achievement tests reflect the expectations described by the group?**

Participants reviewed the achievement tests and selected questions they felt students should be able to answer correctly to demonstrate an acceptable level of performance. Through discussion, the knowledge and skills that students require to answer these questions successfully were listed. The knowledge and skills listed were all very close to the original expectations held by the group.

One area the group thought was important but was not addressed in any of the achievement tests was students' attitudes toward learning. Concern was also expressed that student communication skills were not evaluated in the mathematics and science tests. At minimum, a written component would be needed to do this. The group was not unanimous about whether written skills in science and mathematics should be evaluated if they were already evaluated in language arts and social studies.

The group stated that the writing assignment in social studies was an excellent way to evaluate student knowledge and skills. The assignment presented an issue and required students to state and support a position of their choice.

- **How well did students actually perform on the achievement tests?**

Results showing how well students performed on important multiple-choice items were presented to the group. As well, a first draft of the written-response analysis for social studies was presented.

In all subject areas, students met some of the group's standards; in some areas of learning, achievement was below the group's standards. Some of these areas are listed below.

Science 3

Met Standards
Performance on the test indicated that students:
- know basic plant and animal life in Alberta
- are able to make deductions that require reasoning

Below Standards
Performance on the test indicated that many students have difficulty:
- making judgments related to cause and effect
- understanding interrelationships in the environment
- making practical applications and solving problems

Mathematics 6

Met Standards
Performance on the test indicated that students:
- can perform operations (multiplying, dividing, adding, subtracting)
- can perform one-step problems

Below Standards
Performance on the test indicated that many students have difficulty:
- using information and skills to solve two-step problems
- computing simple averages

Social Studies 9

Met Standards
Performance on the test indicated that students:
- understand points of view
- know centrally planned, mixed, and market economies from a basic (or definitional) perspective

Below Standards
Performance on the test indicated that many students have difficulty:
- understanding the role of labor, the entrepeneur, and the government in the different economies
- distinguishing the interrelationship of social, economic, and political factors in the different economies
- writing effectively when choosing and supporting a position

- **Did the group feel that students' performance on the achievement tests was good enough?**

Generally, the group felt that, given their expectations for both levels, student performance was not good enough.

Several other comments were made during the two-day meeting:

- All participants indicated they had had an adequate opportunity to express their views.
- Participants viewed the activity/discussion approach as an excellent meeting format.
- On many occasions, different participants stated that expectations and standards have to be high to ensure our children are reaching for high goals.
- More time to delve into each subject would have yielded more specific commentary on expectations/learnings.
- This type of meeting should be continued to permit ongoing input from groups representing public interests.

Finally, because of the value of this meeting, and the desire to continue gathering public input into the standards and expectations that exist for student achievement, a similar meeting will be held in the summer of 1992.

A more detailed report on the 1991 meeting was distributed to participants and is available upon request. Please contact Marcia Wright at 427-0010 to obtain a copy of this report.

APPENDIX C
GUIDELINES TO INTERPRETATION OF RESULTS

Following each administration of the achievement tests, a **Provincial Report** is prepared. This report is a public document that describes the aggregated results obtained by those students who wrote achievement tests in a given year. Provincial reports can be used by school board members, superintendents, principals, and teachers as they review results for students in their own jurisdictions and schools. By using the Provincial Report in this way, policymakers and educators can check their perceptions of local achievement against provincewide standards and trends in the levels of achievement.

This **Provincial Report** describes the results achieved by students who wrote the June 1991 achievement tests in Grade 3 Science, Grade 6 Mathematics, and Grade 9 Social Studies.

This year, for the first time, **jurisdiction and school reports** were sent to superintendents and principals before the Provincial Report was ready for distribution. Policymakers and educators in each jurisdiction are encouraged to study carefully the provincial results and their own test results.

It should be noted that results for groups of fewer than 25 students should be interpreted with caution. Results for such groups can be unduly affected by the presence of a few extreme scores when the analyses are performed to produce the respective group statistics. Consequently, any generalizations may appear to indicate performance that is higher or lower, better or worse, than it is in relation to the criteria applied.

Educators at the school and jurisdiction levels can make three kinds of comparisons to decide if the achievement of their students is "good enough." One comparison is in relation to expectations or standards; another is in relation to the achievement of students in the entire province of Alberta; and the third is to look at the jurisdiction results in 1987, when tests in these subjects were last administered. After making these comparisons, teachers, principals, and superintendents can identify the strengths in the programs that were delivered in their grades 3, 6, and 9 classrooms. Where the results show weaknesses, changes can be made where possible and desirable.

USE OF THE REPORTS

The reports are **not** intended to be used as the basis for

- making decisions about student placement or promotion
- evaluating teacher performance
- comparing performance between or among schools.

Administrators in each jurisdiction should apply separate locally developed teacher, school, and school system evaluation policies to the tasks of evaluating teacher and school performance.

The information provided in the reports is factual regarding what the test results are. The interpretation of this information—hypothesizing why results are as they are—involves consideration of the many factors and variables that contribute to achievement.

In addition, it must be noted that the information in these reports is limited to selected objectives of the *Program of Studies*. Many important aspects of learning cannot be measured by the time-limited, paper and pencil achievement tests.

ASSESSMENT STANDARDS AND ACHIEVEMENT STANDARDS

Standards were confirmed for each achievement test and are reported both here in the Provincial Report (sections 1, 2, 3, and 4 and Appendix A) and in tables 2 and 3 of the jurisdiction and school reports. Criteria representing a **standard of excellence** and an **acceptable standard** were confirmed for each of the two major reporting categories (components) of the test. These criteria are referred to as assessment standards. The assessment standards are supplemented by achievement standards, which specify expectations for the percentage of students in the province expected to meet the assessment standards. Appendix A provides more detail on both the standards and the process by which they have been confirmed.

Standards are primarily reported in figures 1-2 to 1-5, 2-1, 2-2, 3-1, 3-2, 4-1, 4-2, and tables 2-3, 2-4, 3-4, 3-5, 4-4 and 4-5 of the Provincial Report and tables 2 and 3 of each school and jurisdiction report. These tables show the number of students writing the test who met or exceeded the provincial achievement standards, the number who were expected to meet or exceed the standards, and the percentages who met the standards on each or both of the two major components of the test. Table 3 of each school and jurisdiction report gives the same information for the total test rather than by major component.

The school and jurisdiction tables also show whether the number of students in that school or jurisdiction who achieved the standard is significantly different from the expected number. A 95% confidence interval is used for these purposes; this criterion means that differences are only reported when there is a 5% or smaller probability that a difference of that size could occur by chance. For schools and jurisdictions with fewer than five or six students, significances cannot be calculated, and the indications are omitted. Although the statistical tests take the number of students into consideration, it is a useful rule of thumb that results for groups of fewer than 25 students must be interpreted with particular caution. Chance variation in small groups is greater.

Educators interpreting these reports are encouraged to consider how well their students have done compared to the assessment standards and how well schools and jurisdictions have done compared to the achievement standards.

COMPARING RESULTS TO AVERAGE SCORES

Overall test results are presented in relation to provincial standards. Tables 4 and 5 of each jurisdiction and school report also provide jurisdiction or school average scores for each reporting category or subtest. Each of these scores may be compared to the provincial average for the same reporting category or subtest to determine if differences exist. Tables 2-7, 3-8, and 4-8 of the Provincial Report provide similar information.

The importance of differences that may exist between jurisdiction or school averages and provincial averages is not always clear. To aid in the interpretation of differences between the averages, jurisdiction and school reports indicate when differences are significant using a 95% confidence interval.

FACTORS LIMITING THE INTERPRETATION OF TEST RESULTS

Educators who are interpreting results must take into account the following limitations:

1. Paper and pencil tests necessarily measure reading achievement in the content area being tested. Standards built into each achievement test reflect the reading level expectation for the grade level tested. Jurisdictions should consider the average reading level of their grades 3, 6, and 9 students, as reading levels below these grades will have an effect on test results.

2. If more than 10% of eligible students in a jurisdiction did not write a test, the reported statistics for that jurisdiction may not accurately represent the true level of achievement.

3. Consideration should be given to the degree to which students in particular classes or grades were motivated to perform to their level of ability.

FACTORS THAT MAY AFFECT STUDENT ACHIEVEMENT

Results on the achievement tests may have been affected by:

1. Environment
   - community environment
   - school environment including staff morale
   - socioeconomic background
   - family circumstances

2. Personal Factors
   - ability
   - attitude
   - motivation
   - aspiration
   - academic background
   - learning style

3. Availability and Appropriateness of Resources
   - programs of study
   - curriculum guides
   - resource materials
   - library services
   - current textbooks
   - references

4. Instruction
   - teacher qualifications (i.e., to teach a particular subject)
   - teacher experience
   - teacher morale
   - professional development
   - staff turnover
   - professional support
   - teaching strategies
   - timetabling constraints or influences

A SYSTEMATIC APPROACH TO THE EFFECTIVE USE OF TEST RESULTS

Achievement test results can be used constructively as one means of improving the quality of education. A systematic use of the test results would include the following steps:

1. Comparing test results for a jurisdiction or school to the provincial results. Be sure that your comparisons include the
   - total test score,
   - total and subtest scores for multiple-choice questions,
   - total and subtest scores for written response assignments (when appropriate),
   - individual multiple-choice question results, and
   - individual written-response question results (when appropriate).

2. Noting any patterns, anomalies, and/or interrelationships in the results.

3. Hypothesizing relationships between your observations and any of the factors listed in these guidelines that may have had an effect on achievement or achievement test results.

4. Considering and implementing a plan that will help to improve the quality of education for students.

AN ADMINISTRATIVE MODEL FOR THE EFFECTIVE USE OF ACHIEVEMENT TEST RESULTS

The following model may be useful for those who wish to develop a constructive system for interpreting achievement test results.

BASIC PRINCIPLES

1. It is desirable and feasible for teachers and school administrators to make use of achievement test results in analysing the performance of their own students.

2. It is more constructive for schools to develop their own analyses, interpretations, and action plans than to have these imposed externally.

3. The impact of factors such as those listed in these guidelines should be analysed and discussed when reviewing achievement test results.

4. Subtest or reporting category results are usually more informative than total test scores.

5. Generalizations should be stated with caution and should be supported by evidence that is independent of achievement test results.

6. It is neither desirable nor productive to compare the results of different schools.

7. Achievement tests measure many of the objectives specified by the curriculum. However, skills and concepts that are not measured by the achievement tests are also to be taught and evaluated at the local level.

8. Staff discussions as well as written reports are useful means of ensuring that results are appropriately interpreted and used.

SUGGESTED CONTENT FOR INTERPRETATION OF INDIVIDUAL SCHOOL RESULTS

1. Subject, grade level, and date of achievement test administration
2. Number of students who wrote the achievement test
3. Profiles of students or groups who wrote the achievement test, which include
   —previous performances
   —number of students repeating the grade
4. Program emphases, such as hours of instruction, skill and content emphases
5. Instructional practices, such as methodology, resources, and the relationship between the program offered and the provincial curriculum
6. Program objectives not measured by the achievement test
7. School results compared with provincial results on subtests
8. Current school results compared with those of previous administrations
9. Discussion of item results, identification of common student errors, and suggestions of ways for reducing the misunderstanding that leads to these errors
10. Recommendations for the following year or semester
11. Summary and concluding comments

SUGGESTED REPORTING STRUCTURE

1. Teachers and/or the principal analyse the results and prepare a written report about each administration of an achievement test.
2. The principal reviews and signs the report.
3. The report is shared with central office supervisory personnel.
4. The appropriate central office supervisory personnel prepare a written response to the report, with copies of the response going to the teachers and the principal.
5. If possible, all involved staff meet to discuss the report and the response.
6. Reports are used to improve the program and maximize future opportunities for student success.
7. When large differences exist between expected and actual achievement test results over time, consideration should be given to conducting a formal program evaluation.

APPENDIX D
REPORTING TO PARENTS

What are the achievement tests?

The achievement tests are provincial government tests administered in Alberta schools to grades 3, 6, and 9 students in language arts, social studies, science, and mathematics.

What is the purpose of the achievement tests?

The achievement tests help Alberta Education to communicate provincial expectations and results for levels of student performance in language arts, social studies, science, and mathematics. The tests enable Alberta Education to monitor the level of achievement of students throughout Alberta. The results also help local school board, principals, and teachers identify the strengths and weaknesses in their implementation of these subjects.

How many achievement tests will my child have to write?

Students write only one achievement test in Grade 3, one in Grade 6, and one in Grade 9. Tests are rotated so that a different subject is tested each year. In 1991, Grade 3 students wrote the science achievement test, Grade 6 students wrote the mathematics achievement test, and Grade 9 students wrote the social studies achievement test. In 1992, Grade 3 students will write the social studies achievement test, Grade 6 students will write the language arts achievement test, and Grade 9 students will write the mathematics achievement test.

How should I prepare my child to write an achievement test?

No preparation beyond normal classroom instruction is required to write an achievement test. While students should be encouraged to do their best, a good night's sleep and a relaxed, confident approach to testing are the best possible preparation.

How much do these tests count for my child?

The achievement tests do NOT affect students' final marks. The classroom teacher is responsible for evaluating students and awarding final marks. Achievement test results are not released by Alberta Education until October, long after students' marks have been determined by the classroom teacher.

How do achievement test results help classroom teachers?

Achievement test results provide feedback on student achievement to school boards, principals, and teachers. For example, teachers in a school that consistently scores high on one part of the curriculum but low on another may wish to examine their programs to see if changes are needed to achieve a better instructional balance.

What are the limitations of the achievement tests?

Paper and pencil tests cannot easily measure such things as laboratory skills, small group discussions, and creative thinking. Thus, some student strengths can be evaluated only by the classroom teacher. Also, a single test cannot reveal as much about a student's development and growth as can evaluation by the classroom teacher over the course of a full school year.

What advantage do achievement tests have over other standardized tests?

Unlike commercially developed tests, achievement tests are based specifically on Alberta's programs of study and are designed, written, and evaluated by experienced classroom teachers from across the province. Tests developed elsewhere may not reflect curriculum or standards appropriate for Alberta.

How do I interpret achievement test results?

The *Achievement Testing Program Provincial Report* includes guidelines for interpreting results. Readers are cautioned not to overgeneralize conclusions based on a single administration of the test. Results should be compared with expectations or with the results of previous achievement tests in the same subject. Any trends that are observed in the scores must then be interpreted in the context of a variety of factors that could affect student achievement, such as the school and community environment, students' socioeconomic background, and available learning resources.

Comparisons between districts, schools, or classrooms are likely to prove misleading and are therefore discouraged.

Can I find out how my child did on the achievement test?

Individual results for the achievement tests are made available to school principals. Since the tests are designed to gather information on groups of students and not on individuals, individual results must be interpreted with caution.

Where can I get additional information about the Achievement Testing Program?

Bulletins describing the content of the coming year's achievement tests and the Provincial Report describing the results of the previous year's testing are distributed to schools each fall. Requests for copies of these publications or questions and comments regarding the Achievement Testing Program should be directed to:

Mr. Dennis Belyk
Assistant Director
Achievement Testing and Diagnostic
  Evaluation Programs
Student Evaluation Branch
Alberta Education
Devonian Building, West Tower
11160 Jasper Avenue
Edmonton, Alberta T5K 0L2

APPENDIX E
DEVELOPING ACHIEVEMENT TESTS

The Student Evaluation Branch develops achievement tests that measure student achievement at the grades 3, 6, and 9 levels. Provincewide testing in language arts, mathematics, science, and social studies follows a four-year cycle for each grade level and subject. Many individuals and groups are involved in the development of each test: practising classroom teachers, school and central office administrators, and representatives of postsecondary institutions, the Curriculum Design Branch, the Language Services Branch, Regional Offices, and the Student Evaluation Branch. Student Evaluation Branch staff ensure that valid and reliable tests are developed.

The following is a summary of the phases of the test development process:

- Planning
- Approving Blueprints
- Developing Test Questions
- Constructing and Administering Field Tests
- Analysing and Revising
- Constructing Final Field Tests
- Approving Final Field Tests
- Administering Final Field Tests
- Constructing the Final Test
- Preparing and Administering the Final Test
- Marking
- Analysing and Reporting the Results

Under normal circumstances, it takes three years to complete all phases of the process.

PLANNING

Test developers ensure that the design of each achievement test reflects the goals and objectives of the *Program of Studies* and the curriculum specifications for each subject. Planning takes into consideration those parts of the program that are testable in a paper and pencil format within a given time frame. Teachers and consultants from across the province assist in preparing the design of each test.

Test developers prepare an interim test blueprint (an overall plan used to guide the development of a test). Questions that must be addressed at this point are:

- What knowledge and skills should students be expected to possess?
- What types of questions will constitute the test (multiple choice, short answer, or extended written response)?
- What weighting will each part of the test be given?
- How long and how demanding should the test be?
- How should the results of the test be organized for reporting purposes?

In order to ensure that each test will produce meaningful and reliable results, test developers incorporate statistical as well as curricular standards in the test design. Statistical standards include projected test means, range of question difficulty, and the requirements for reporting. For example, the ideal mean of a multiple-choice test containing questions with four alternatives is 62.5%. This is the midpoint between chance selection (25%) and perfection (100%). The range of difficulty of multiple-choice questions is expected to vary from 30% to 85% to ensure that students with varying ability levels are challenged.

Each dimension of the curriculum for which results are reported must contain at least six questions if the results are to be meaningful.

APPROVING BLUEPRINTS

Blueprint approval establishes the overall design of the test, the exact emphases given to each category for which results are reported, and the emphases given to the different cognitive levels.

The interim blueprint is reviewed by a committee of Alberta Education personnel that represents the Curriculum Design Branch (or Language Services Branch), Regional Office consultants, and the Student Evaluation Branch. This committee makes recommendations to the Director of the Student Evaluation Branch.

The blueprint recommended by the Alberta Education committee is then reviewed by a Test Review Committee, which consists of members nominated by the Alberta Teachers' Association, the Conference of Alberta School Superintendents, postsecondary institutions, and Alberta Education. This committee makes recommendations to the Director of the Student Evaluation Branch.

DEVELOPING TEST QUESTIONS

Following blueprint approval, committees of practising classroom teachers working at the appropriate grade level are formed, and question development meetings are held. These committees develop new test questions that reflect the goals and objectives of the *Program of Studies* and curriculum specifications. Where necessary, question developers are trained in the principles of question construction. Questions built in committee are then screened for format, validity, blueprint 'fit', and other design considerations.

CONSTRUCTING AND ADMINISTERING FIELD TESTS

After careful editing and formatting of questions developed by the teacher committees, field tests are constructed. Any required artwork is completed during this phase of the test development process.

With permission from school and jurisdiction personnel, field tests are sent to a number of teachers throughout Alberta. The students involved are representative of the student population for which the test has been designed. A minimum sample of 150 students writes each field test.

Teachers who administer a field test are asked to comment in writing on the following:

- reading level
- how closely the question matches the way in which a concept was taught
- level of difficulty of the questions
- quality of the questions and graphics
- errors of any kind

The results from the administration of this initial round of field tests are used to validate content, to determine difficulty levels, and to ensure that questions are expressed clearly. Special field tests are also constructed to "try out" new assessment strategies and techniques that may be useful for future assessments.

ANALYSING AND REVISING

The results of each field test are then analysed and scrutinized to determine whether individual questions require revision. Teacher comments regarding the way that test questions are structured and the way that a subject is being taught are also carefully considered and used to guide revision.

Questions deemed to require changes are revised and submitted for further field testing.

CONSTRUCTING FINAL FIELD TESTS

Once the initial field test results are thoroughly analysed and questions requiring changes are revised, final field tests are constructed. These field tests follow the approved blueprint and parallel the actual achievement test in format and design.

Final field tests, like all field tests, are submitted for further validity checking, editing, and proofreading. In grades 6 and 9, separate tests in English and in French are developed for language arts. At this point, all other tests for Grade 6 and Grade 9 are translated into French.

APPROVING FINAL FIELD TESTS

After the final field tests have been constructed, a second meeting of the Alberta Education Committee that represents the Curriculum Design Branch (or Language Services Branch), Regional Office consultants, and the Student Evaluation Branch is convened. This committee reviews the final field tests and makes recommendations for improvement.

The Test Review Committee, which approved the blueprint in phase two of the test development process, meets a second time to review and recommend for approval the final field tests and the instructions for administering the tests. If a test includes short-answer or extended-writing questions, the Test Review Committee discusses standards of achievement and marking standards appropriate for the test. Again, this committee makes recommendations to the Director of the Student Evaluation Branch.

ADMINISTERING FINAL FIELD TESTS

The final field tests are administered and the results are used as a final screen in selecting questions for placement on the provincial achievement test. A minimum sample of 250 students writes each final field test. The sample is selected to include:

- only students who have received instruction in the course
- students representing a normal distribution of ability levels
- students from rural and urban schools
- students from large and small schools

CONSTRUCTING THE FINAL TEST

The construction of the final test form is based upon information collected from the final field test administration. The Test Review Committee is reconvened to review the final test form.

The test is submitted for final validity checking, editing, and proofreading. Grade 6 and Grade 9 achievement tests, in subjects other than language arts, are translated into French.

For each test, an information bulletin is prepared that outlines the design and nature of the upcoming tests. These bulletins are distributed to each school in September to facilitate program and instructional planning by teachers and administrators.

PREPARING AND ADMINISTERING THE FINAL TEST

The completed achievement test is commercially printed and prepared for distribution. Sufficient copies of the test are mailed to each school. Quantities are based on the number of students enrolled in the subject as reported to the Student Evaluation Branch. The test is administered to students by their classroom teachers.

MARKING

All written-response sections of the tests are marked by classroom teachers. These teachers, who are recommended by their superintendents, are currently teaching the course being evaluated, have taught the course for a minimum of two years, and hold a valid Alberta Permanent Professional Certificate. Student Evaluation Branch staff train and supervise the teachers during the marking sessions. All multiple-choice responses are machine scored.

ANALYSING AND REPORTING THE RESULTS

A results report is prepared and distributed to superintendents, school principals, Alberta Education officials, and other Departments of Education. This report is also made available to the general public. In addition to the *Achievement Testing Program Provincial Report*, each school and jurisdiction receives a statistical summary for its student population.

For further information, please refer to the Achievement Test Bulletins, or call the Assistant Director, Achievement Testing and Diagnostic Evaluation Programs, at 427-0010.

ACHIEVEMENT TESTING PROGRAM
PROVINCIAL REPORT QUESTIONNAIRE

The Student Evaluation Branch strives to produce documents that will be useful to the educational community. The purpose of the following questionnaire is to collect your opinions about the *Provincial Report*. These opinions will be considered when the content and format of the report are reviewed before June 1992.

Please take a moment to respond to the following questions. Then detach this sheet and send it to:

Mr. Michael Robinson
Assistant Director, Analytic Services
Student Evaluation Branch
Alberta Education
11160 Jasper Avenue
Edmonton, Alberta T5K 0L2

USE OF THE REPORT

Please check the boxes that apply to you.

1. My present role is primarily that of

   - teacher ☐
   - school administrator ☐
   - central office administrator ☐
   - school board member ☐
   - other (please specify) ____________________

2. I read the report, but I DID NOT use it to interpret the results attained by my students. ☐

3. I read the report, and I used it to interpret the results attained by the students in

   - my classroon ☐
   - my school ☐
   - my jurisdiction ☐

Please respond to the following statement if you have checked one of the three boxes in question 3.

4. I have made use of the results to alter the educational program offered in

   - my classroon ☐
   - my school ☐
   - my jurisdiction ☐

Continued

CONTENT OF THE REPORT

1. Please judge the usefulness of the information included in the various sections of the report by checking the appropriate boxes below.

	Very Useful	Adequate for Use	Of Some Use	Of No Use
Section 1: Summary of Achievement Test Results	☐	☐	☐	☐
Section 2: Grade 3 Science	☐	☐	☐	☐
Section 3: Grade 6 Mathematics	☐	☐	☐	☐
Section 4: Grade 9 Social Studies	☐	☐	☐	☐
Section 5: Achievement By Gender	☐	☐	☐	☐
Section 6: Achievement By Age	☐	☐	☐	☐
Section 7: Achievement by Grade Level	☐	☐	☐	☐
Section 8: Achievement Over Time	☐	☐	☐	☐
Section 9: Directions: Broadened Assessment	☐	☐	☐	☐

2. If you wish, please comment further on the content of the report in the space below.

FORMAT OF THE REPORT

1. Please judge the usefulness of the report's format by checking the appropriate boxes below.

	Very Useful	Adequate for Use	Of Some Use	Of No Use
Organization into Separate Sections	☐	☐	☐	☐
Double-Column Presentation of Text	☐	☐	☐	☐
Presentation of Figures	☐	☐	☐	☐
Presentation of Tables	☐	☐	☐	☐
Blending of Information in Text, Figures, and Tables	☐	☐	☐	☐

2. If you wish, please comment further on the format of the report in the space below.